Planning Guide for Maintaining School Facilities

FINAL DRAFT - September 2002
NOT FOR DUPLICATION OR CITATION

Prepared by the
School Facilities Maintenance Task Force
of the
National Forum on Education Statistics
and ASBO® International

Sponsored by the National Center for Education Statistics

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Acknowledgments

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The task force also wishes to acknowledge the efforts of many organizations and individuals who contributed to the development of this document. These include Massachusetts ASBO, Michigan ASBO, Pennsylvania ASBO, Texas ASBO, and the National Clearinghouse for Educational Facilities. Bethann Canada of the Virginia Department of Education served as the chairperson of the National Education Statistics Agenda Committee, which was the task force's sponsor within the National Forum on Education Statistics. Students in Katy, Texas deserve recognition for volunteering their creative skills to draw "maintenance eagle" logos for the document. The submission by Alex Fosnaugh, a student at Mayde Creek High School in Katy, Texas, was selected to be included in the Guide. Marty Taylor edited the document, and The Creative Shop provided layout and design services.

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Executive Summary

As America's school buildings age, we face the growing challenge of maintaining the nation's education facilities at a level that enables our teachers to meet the needs of 21st Century learners. Facilities issues arise at all educational levels, from pre-kindergarten through postsecondary, and all sites, including both classrooms and administrative offices. Challenges arise in new and old facilities alike, although the types of concerns might be different.

Because we know that routine and unexpected maintenance demands are bound to arise, it is of paramount importance that every education organization proactively develop and implement a plan for dealing with these inevitabilities. A sound Facilities Maintenance Plan serves as evidence that school facilities are, and will be, cared for appropriately. Negligent facilities maintenance planning can cause real problems. Large capital investments can be squandered when buildings and equipment deteriorate or warranties become invalidated. Failing to maintain school facilities adequately also discourages future public investment in the education system.

However, school facilities maintenance is concerned about more than just resource management. It is about providing clean and safe environments for children. It is also about creating a physical setting that is appropriate and adequate for learning. A classroom with broken windows and cold drafts doesn't foster effective student learning. But neither does an apparently state-of-the-art school that is plagued with uncontrollable swings in indoor temperature.

To some people's surprise, facilities problems are less likely a function of geography or socioeconomics and more directly related to staff levels, training, and practices—all of which can be controlled by the organization. Thus, every education agency must plan to meet the challenges of effective facilities maintenance. It is simply too big a job to be addressed in a haphazard fashion. The consequences affect teaching and learning, student and staff health, day-to-day building operations, and the long-range fiscal outlook of the entire organization.

Experience at the local, state, and national levels suggests that effective school facility maintenance planning can:

- **contribute to an organization's instructional effectiveness and financial well-being;**
- **improve the cleanliness, orderliness, and safety of an organization's facilities;**
- **reduce the operational costs and life cycle cost of a building;**
- **help staff identify facilities priorities proactively rather than reactively;**
- **extend the useful life of buildings; and**
- **increase energy efficiency and help the environment.**

This *Planning Guide for Maintaining School Facilities* is designed for staff at the local school district level, where most facility maintenance is planned, managed, and carried out. This audience includes school business officials, school board members, superintendents, principals, facilities maintenance planners, maintenance staff, and custodial staff. The *Guide* is also relevant to the school facilities interests of state education agency staff, community groups, vendors, and regulatory agencies.

Because no two organizations face precisely the same challenges, the *Guide* does not focus on a single template for a facilities maintenance plan, but rather on "best practice" processes an education organization can undertake to construct a sound facility maintenance plan that meets its unique needs and circumstances. The document offers recommendations on issues of vital importance such as:

- Why Does Facilities Maintenance Matter?
- Planning for School Facilities Maintenance
- Facilities Audits (Where to Begin)
- Providing a Safe Environment for Learning
- Maintaining School Facilities and Grounds
- Effectively Managing Staff and Contractors
- Evaluating Facilities Maintenance Practices

A primary focus of the *Guide* is the user-friendly presentation of the recommendations. Thus, the document includes checklists and sample materials from facility maintenance professionals throughout the country, as well as links to additional resources that support school facility maintenance initiatives. It also relies upon vignettes and case studies to help ensure that connections between "best practice" and the real world are evident.

In a nutshell, the *Planning Guide for Maintaining School Facilities* focuses on:

- ✓ **school facility maintenance as a vital task in the responsible management of an education organization**
- ✓ **the needs of an education audience**
- ✓ **strategies and procedures for planning, implementing, and evaluating effective maintenance programs**
- ✓ **a process to be followed, rather than a canned set of 'one size fits all' solutions**
- ✓ **'best practice' recommendations, rather than mandates**

This *Planning Guide for Maintaining School Facilities* is the product of a cooperative endeavor between the National Forum on Education Statistics (http://nces.ed.gov/forum) and the Association of School Business Officials (ASBO®) International (http://www.asbointl.org). The project was sponsored by the National Center for Education Statistics (NCES) (http://nces.ed.gov), U.S. Department of Education. Roger Young (ryoung@haverhill-ma.com), Haverhill (MA) Public Schools, chaired the Forum's School Facility Maintenance Task Force, which was charged with developing the document. Lee Hoffman managed the project for the National Center for Education Statistics.

The *Guide* is available at no cost via the World Wide Web at http://nces.ed.gov/forum/publications.asp. One free copy of the paper document can be ordered at the U.S. Department of Education's ED PUBS Online Ordering System at http://www.ed.gov/about/ordering.jsp or 877-4-ED-PUBS. Multiple copies can be ordered for a fee at the U.S. Government Online Bookstore at http://bookstore.gpo.gov/index.html or 888-293-6498. For more information about this document or other free resource from the National Forum on Education Statistics and the National Center for Education Statistics, visit http://nces.ed.gov/.

Preface

About this Planning Guide

This planning guide is the product of a cooperative endeavor between the National Forum on Education Statistics (http://nces.ed.gov/forum) and the Association of School Business Officials (ASBO®) International (http://www.asbointl.org). The project was sponsored by the National Center for Education Statistics (NCES) (http://nces.ed.gov) of the U.S. Department of Education. All three organizations recognize the importance that appropriate school facilities maintenance planning plays in providing safe, clean, instructionally supportive, and cost-effective schools.

NCES and the National Forum on Education Statistics are especially aware of the role education data can play in informing facilities maintenance planning and operations. To this end, the Forum has developed a complementary publication, titled *Facilities Information Management: A Guide for State and Local Education Agencies*, which defines facilities data elements that are useful for education policymaking. It can be ordered through the U.S. Department of Education's Publication Center (1-800-4ED-PUBS) or downloaded from the Forum Website at http://nces.ed.gov/forum/publications.asp.

ASBO® International is a professional association with a mission to promote the highest standards of school business management and the effective use of educational resources. ASBO supports a standing committee on school facilities and recognizes the positive impact school facilities maintenance planning can have on the financial and operational well being of an educational organization.

NCES, the National Forum on Education Statistics, and ASBO International are pleased to provide this document to education administrators, facilities staff, community members, and other individuals who are interested in the responsible management of our nation's school facilities. We believe that investing in the proper maintenance of school facilities is both a sound business and wise pedagogical decision.

The information and opinions published here are the product of the National Forum on Education Statistics and do not necessarily represent the policy or views of the U.S. Department of Education or the National Center for Education Statistics.

Formatting Conventions: Facilities maintenance planning is a topic that requires the consideration of both broad issues of policy development and detailed concerns of day-to-day maintenance and operations. Thus, the authors rely upon several graphical conventions to help emphasize significant points and improve navigation throughout the Guide.

A "little birdie" isn't telling you, but the "maintenance eagle" is…

The appearance of the "maintenance eagle" signifies the occurrence of a vignette that is intended to illustrate how good facilities maintenance (or a lack thereof) can sometimes play out in the real world.

"Key" Points…

The ring of keys (which can sometimes be seen hanging from the belt of your local facilities maintenance worker) signifies that an especially important, or "key", point is being made.

"Road Markers" to the Web…

The road signs serve as pointers beyond this document to valuable resources available in print or on the World Wide Web.

Chapter 1

Why Does Facilities Maintenance Matter?

When maintaining a school, we pay not only for bricks and mortar, but also student and staff well-being. Effective school maintenance protects capital investment, ensures the health and safety of our children, and supports educational performance.

Table of Contents:

Goals:

- ✓ ***To explain how clean, orderly, safe, cost-effective, and instructionally-supportive school facilities enhance education.***
- ✓ ***To introduce the purpose, structure, and format of the planning guide.***

Research Shows…

- *A positive relationship exists between school conditions and student achievement and behavior.* [1]
- *Facility condition may have a stronger effect on student performance than the combined influences of family background, socio-economic status, school attendance, and behavior.* [2]
- *Students are more likely to prosper when their environment is conducive to learning… well-designed systems send a powerful message to kids about the importance a community places on education.* [3]

[1] *Lyons, J.B. (2001) Do School Facilities Really Impact a Child s Education? Scottsdale, AZ: Council of Educational Facility Planners International, Scottsdale, AZ. (http://www.cefpi.org:80/pdf/issue14.pdf)*

[2] *Morgan, L. (2000) Where Children Learn: Facilities Conditions and Student Test Performance in Milwaukee Public Schools. Council of Educational Facility Planners International, Scottsdale, AZ.*

[3] *Withrow, F., Long, H., and Max, G. (1999) Preparing Schools and School Systems for the 21st Century. American Association of School Administrators, Arlington, VA.*

Pay Me Now or Pay Me Later

"Pay me now or pay me later," barked the man on the TV commercial for car oil filters. The underlying message in the ad was clear: if you spent a few dollars now to change the filter in your car, you could prevent more expensive repairs in the future. This is 'preventive maintenance' in its simplest form—spending a little money now to perform regular inspections and maintenance in order to minimize future big-ticket costs and prolong the functional lifetime of buildings and equipment.

Frank Norwood, Director of Maintenance & Operations, Katy (TX) Independent School District (Adapted with permission from the Texas Association of School Business Officials)

Introduction to School Facilities Maintenance Planning

Effective facilities maintenance extends the life of older facilities and maximizes the useful life of newer facilities.

As America's school buildings age, we face the growing challenge of maintaining the nation's school facilities at a level that enables our teachers to meet the needs of 21st Century learners. Our education system has made great advances throughout its history—demanding that the school buildings that house this system also be kept current. While the construction of new school facilities supports this task, many buildings have developed modularly over time. A 1920s era school might have gotten an addition in 1950, which in turn got an addition in 1970, and again in 1990. Although some of these historic buildings are architecturally significant, the task of caring for them at a level that supports contemporary instructional practices is substantial. At the same time, maintaining the finely tuned workings of a newly constructed and technologically advanced facility demands considerable expertise and commitment as well.

Thus, it is perhaps not surprising that facilities issues arise at all educational levels, pre-kindergarten through postsecondary, and all sites, both school buildings and administrative offices alike. Challenges arise in both new and old facilities, although the types of concerns might be different. For example, even a brand new building can run into problems with inadequate air circulation, which can lead to indoor air quality (IAQ) problems unless remedied. Older buildings, on the other hand, more frequently face issues as a result of the aging process, such as shortcomings in energy management and conservation. As these deficiencies become more severe, indoor climate can become uncomfortable and utility bills can increase significantly.

What causes facilities problems? Certainly extreme environmental conditions and a lack of maintenance funding contribute to building deterioration. But, perhaps to

some people's surprise, facilities problems are less likely a function of geography or socioeconomics and more directly related to staff levels, training, and practices. Because we know that routine and unexpected maintenance demands are bound to arise, it is of paramount importance that every education organization proactively develop and implement a plan for dealing with these inevitabilities. Thus, an organization must plan to meet the challenges of effective facilities maintenance. It is simply too big of a job to be addressed in a haphazard fashion. After all, the consequences affect teaching and learning, student and staff health, day-to-day building operations, and the long-range fiscal outlook of the entire organization.

An organization must plan to meet the challenges of effective facilities maintenance. It is simply too big of a job to be addressed in a haphazard fashion.

Good facilities maintenance costs money. There is no question about it. But unlike other investments, the return on the expenditure doesn't necessarily result in increased revenues. Instead, facilities maintenance produces savings by:

1) ***decreasing equipment replacement costs over time (which would otherwise accrue more quickly when maintenance is deferred);***
2) ***decreasing renovation costs because fewer large scale repair jobs are needed; and***
3) ***decreasing overhead costs (e.g., utility bills) because of increased system efficiency.***

A sound Facilities Maintenance Plan serves as evidence that school facilities are, and will be, cared for appropriately. On the other hand, negligent facilities maintenance planning can cause real problems. Large capital investment can be squandered when buildings and equipment deteriorate or warranties become invalidated. Failing to maintain school facilities adequately also discourages future public investment in the education system.

Having a coordinated maintenance plan is the first, and most important, step in exercising control over the destiny of your school buildings!

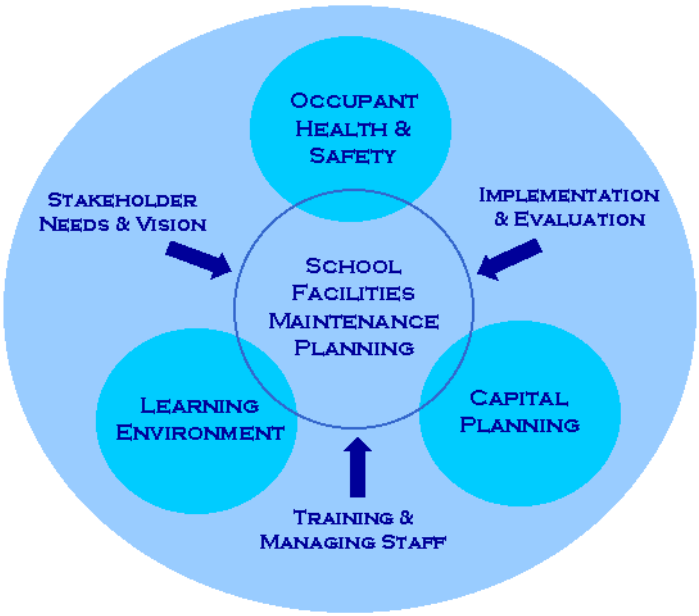
However, school facilities maintenance is concerned about more than just resource management. It is about providing clean and safe environments for children. It is also about creating a physical setting that is appropriate and adequate for learning. A classroom with broken windows and cold drafts doesn't foster effective student learning. However, neither does an apparently state-of-the-art classroom that is plagued with uncontrollable swings in indoor temperature, which can negatively affect

The condition of a school facility is not just an issue for the facility manager—but for staff, students, and the entire educational community alike. Poor indoor air quality, for example, can negatively impact student alertness, attendance, and achievement!

student and instructor alertness, attendance, and even health.

Planning for school facilities maintenance helps to ensure that school buildings are:

Clean, Orderly, Safe
Cost-effective and Instructionally-supportive



School facilities maintenance affects the physical, educational, and financial foundation of the entire school enterprise and should, therefore, be a focus of both its day-to-day operations and long-range management priorities.

Meeting legal standards with regard to facilities maintenance is the bare <u>minimum</u> for responsible school management. Planners must also strive to meet the spirit of the laws and the long-term needs of the organization.

Who Should Read This Document?

Because facilities maintenance planning is constrained by real world budgets, planners must often think in terms of tradeoffs. Thus, they must weigh routine day-to-day tasks against preventive maintenance that pays off only over the long run, while always needing to be prepared for emergency responses to broken air conditioners, cracked pipes, and unexpected snow storms. The difficult job of planning for facilities maintenance is most effectively managed when it relies upon up-to-date information about the condition and use of buildings, campuses, equipment, and personnel. It is not surprising, therefore, that staff who are intimately involved in the day-to-day assessment, repair, and maintenance of school facilities must also play an active role in the facilities maintenance planning process. Having said this, facilities maintenance planning is more than just a "Facilities Department" task. Effective planning requires coordination of resources and, therefore, commitment from the organization at all levels.

Facilities maintenance planning is more than just a "Facilities Department" task. Effective planning requires coordination of resources and, therefore, commitment from the organization at all levels.

Document Purpose

This planning guide is written to help school administrators, staff, and community members better understand why and how to develop, implement, and evaluate a facilities maintenance plan.

Document Audience

The primary audience of this Guide is staff at the local school district level, where most facilities maintenance is planned, managed, and carried out. This includes board members, superintendents, business officials, principals, facilities managers, maintenance personnel, and custodians. Secondary audiences include state education agency staff, community members, vendors, regulatory agencies, and students in education administration courses.

Our vision of this *Planning Guide for Maintaining School Facilities* encourages information-based decision-making in this crucial, yet often overlooked, aspect of the educational services provided by schools. Because no two organizations face the same challenges, this planning guide focuses not on a single template for a Facilities Maintenance Plan, but rather on **best practice processes** that can be undertaken to construct a sound Facilities Maintenance Plan that meets the unique needs of an education organization.

In a Nutshell…

Experience at the local, state, and national levels suggests that effective school facility maintenance planning can…

- ✓ Contribute to an organization's instructional-effectiveness and financial well-being.
- ✓ Improve the cleanliness, orderliness, and safety of an organization's facilities.
- ✓ Reduce the operational costs and life cycle cost of a building.
- ✓ Help staff deal with limited resources by identifying facilities priorities proactively rather than reactively.
- ✓ Extend the useful life of buildings.
- ✓ Increase energy efficiency and help the environment.

With regard to this publication, specifically, it should be noted that this planning guide:

- ✓ Argues that school facility maintenance is a vital component of the responsible management of an education organization.
- ✓ Focuses specifically on the needs of an education audience (i.e., it is written specifically for education administrators and staff at the building, campus, district, and state levels).
- ✓ Stresses *strategies* and *procedures* for planning, implementing, and evaluating effective maintenance programs.
- ✓ Describes a process to be followed, not a canned set of 'one size fits all' solutions.
- ✓ Includes 'best practice' recommendations, not mandates.
- ✓ Stems from another National Forum on Education Statistics' publication titled *Facilities Information Management: A Guide for State and Local Education Agencies* (visit http://nces.ed.gov/forum/publications.asp to view an electronic version or call the U.S. Department of Education Publication Center at 1-877-4ED-PUBS for a free paper copy).

- ✓ Is also available electronically at http://nces.ed.gov/forum/publications.asp.

Moreover, this planning guide *is not:*

- ✓ Presented as a how-to manual of maintenance procedures and instructions.
- ✓ An attempt to dictate policy making in local and state education agencies (although it can and should serve as a guide to policy makers as they consider their options and needs).

Effective school facilities maintenance plans have…

Administrators who:
- ✓ Recognize that facility maintenance contributes to the physical and financial well being of the organization
- ✓ Understand that school facility maintenance affects building appearance, equipment operation, student and staff health, and student learning
- ✓ Appreciate that facility maintenance requires funding
- ✓ Acknowledge that strategic planning for facilities maintenance is a team effort that requires input and expertise from a wide range of stakeholders
- ✓ Coordinate facility maintenance activities throughout the organization
- ✓ Demand appropriate implementation and evaluation of facilities maintenance plans

Facilities staff who:
- ✓ Understand a wide range of facilities operations and issues
- ✓ Receive training needed to improve knowledge and skills related to facilities maintenance
- ✓ Educate school and district administrators about facility operations
- ✓ Teach other staff how they can help with facilities maintenance
- ✓ Cooperate effectively with policy-makers and budgetary decision-makers
- ✓ Appreciate that facility maintenance decision-making is influenced by instructional needs

Teachers who:
- ✓ Recognize that facilities maintenance support student learning
- ✓ Educate students about how to treat school facilities appropriately
- ✓ Communicate their expectations for facilities as they relate to enhancing student learning
- ✓ Treat facilities with respect

Students who:
- ✓ See school facilities as their learning environment
- ✓ Treat facilities with respect

Parents and community members who:
- ✓ Recognize that school facilities are the training grounds for future citizens and leaders
- ✓ Respect decision-making regarding school facility use and maintenance
- ✓ Contribute to school facility maintenance decision-making as requested
- ✓ Consent to the financial obligations associated with good school facility maintenance

Planning Guide Framework

This planning guide includes the following chapters and information:

Chapter 1: Why Does Facilities Maintenance Matter? Chapter 1 describes the planning guide's purpose, scope, intended audience, and organization.

***Chapter 2: Planning for School Facilities Maintenance*.** Chapter 2 discusses the vital role that facilities maintenance *planning* plays in the management of an effective learning environment. It also presents a process for developing a vision statement, justifying planning from a budgetary perspective, using data to inform decision-making, and identifying the components of a good facilities maintenance plan.

***Chapter 3: Facility Audits: Knowing What You Have*.** Chapter 3 focuses on the necessary, but sometimes overlooked, step of inventorying both school buildings and grounds. It also describes how best to collect, manage, and use data from a facilities audit.

***Chapter 4. Providing a Safe Environment for Learning*.** Chapter 4 highlights several safety-related issues that demand the absolute attention of those persons responsible for facilities maintenance planning and the day-to-day operations of a school building.

***Chapter 5. Maintaining School Facilities and Grounds*.** Chapter 5 details strategies for planning and implementing "best practices" for maintaining facilities and grounds. It also reminds readers that an ounce of prevention is worth a pound of cure.

***Chapter 6. Effectively Managing Staff and Contractors*.** Chapter 6 shares "best practice" strategies for managing staff and emphasizes the importance of sound human resources management as a precondition for effective facilities maintenance.

***Chapter 7. Evaluating Facilities Maintenance Efforts*.** Chapter 7 recommends periodic evaluation of the overall facility maintenance program and explores various approaches to performing program evaluations.

Appendix A. Complete List of Chapter-by-Chapter Checklists

Appendix B. Complete List of Additional Resources

Appendix C. State School Facilities Websites

Appendix D. Audit Form Template

Appendix E. Model Job Description for a Custodial Worker

Appendix F. Record Layout for a Computerized Work Order System

Appendix G. Using Mapping during the Interview Process

Appendix H. Useful Interview Questions

Appendix I. Sample Customer Survey Form

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In Every Chapter…

Each chapter of this planning guide is organized in the same general way. This includes:

- ✓ ***Table of Contents***… to simplify navigation within the chapter.
- ✓ ***Chapter Goal(s)***… to understand the major purposes of the chapter.
- ✓ ***Best Practice Recommendations***… to describe how to accomplish the goals.

- ✓ ***Vignettes***… to show how maintenance issues can play out in the real world.
- ✓ ***Commonly Asked Questions***… to address anticipated concerns.
- ✓ ***Checklists***… to summarize recommendations in a straightforward manner.
- ✓ ***Additional Resources***… to point readers to related information.

Commonly Asked Questions

What is a facilities maintenance plan? As the term implies, a "facilities maintenance plan" details an organization's strategy for proactively maintaining its facilities. Effective maintenance plans reflect the vision and mission of the entire organization, include an accurate assessment of existing facilities, incorporate the perspectives of various stakeholder groups, and focus on preventive methods and measures that ensure that capital investment is managed responsibly. As with any successful management endeavor, good facilities maintenance plans integrate best practices of planning, implementation, and evaluation.

How will a maintenance plan make our schools better? Learning does not occur in a vacuum. Students and staff interact more constructively in an environment that is orderly, clean, and safe. Poor air quality, for example, can negatively affect student alertness, and student and teacher attendance, which has a corresponding impact on student achievement. On the other hand, classrooms that are well ventilated, suitably lighted, and properly maintained actually facilitate learning. Moreover, appropriate facilities maintenance extends the life span of older facilities and maximizes the useful life of newer facilities. Thus, a facilities maintenance plan contributes to both the instructional and financial well being of an education organization and its community.

Why would our school district need to rethink its facilities plan when we just wrote one five years ago? Facilities plans, like buildings, don't age well unless they are maintained on an ongoing basis. For starters, maintenance strategies are dependent upon the status of existing facilities, which change over time. If the condition of your buildings, grounds, and equipment have changed in the past five years (which they probably have), but your facilities plan hasn't, you're going to have a difficult time knowing what steps need to be taken to maintain the community's valuable assets.

Why do I need a planning guide to tell me how to keep our schools and grounds in good condition? Your organization may already be keeping its schools and grounds in good condition. If so, then spending a few hours reviewing these recommendations is probably a small investment relative to the amount of energy you already put into your facilities maintenance efforts—especially if there's a chance (and there is) that you might find something new and useful in this planning guide. If your organization doesn't keep its schools and grounds as well as it might, then read on…

To err is human… but you'd like to avoid this kind of thing all the same!

The school board was happy, the community was proud, and the students were ecstatic. The high school had finally invested in a gymnasium that would meet the needs of the physical education department, the athletic department, and community organizations alike. After only four years of use, the facility looked to be in great shape, so everyone was shocked to find that school had been cancelled on a Monday morning so that the maintenance staff could combat a flood that had gushed across the gym floor and into the main building. What had happened? A $12 gasket had failed—but it happened to be the one that sealed the 40,000 gallon back up water tank that lay adjacent to the gymnasium. Even that, however, could have been overcome had not the tank's emergency drain been covered with boxes of books in a misguided attempt to increase the building's storage space. As it was, school was cancelled for two days, emergency response cost $26,000, and the gymnasium was closed to school and community users alike for five weeks while $160,000 worth of repair work was performed.

How could this problem have been avoided? In truth, there were many things that could have saved the district from its woes:

Solution 1. Acceptable Maintenance – Might regular equipment inspections of the backup water tank have identified a defective gasket and prevented the flood? Perhaps so!

Solution 2. Proper Planning – Might there have been another, less perilous, place to construct the water tank, rather than over the gymnasium floor? Probably so!

Solution 3. Appropriate Operations – Shouldn't someone have had enough common sense to know that covering an emergency drain with boxes simply wasn't an acceptable storage system? Definitely so!

These and other issues will be addressed throughout this planning guide.

Introductory Facilities Maintenance Checklist

More information about accomplishing checklist points can be found in the text on the page listed in the right hand column.

Accomplished		Check Points	Page
Yes ✓	No ✕		
		Are top-level decision-makers aware that school facilities maintenance affects the instructional and financial well-being of the organization?	15
		Are top-level decision-makers aware that the occurrence of facilities problems (and lack thereof) is most closely associated with organizationally controlled issues such as staffing levels, staff training, and other management practices?	15
		Are top-level decision-makers aware that having a coordinated and comprehensive maintenance plan is the first and most important step in exercising control over the destiny of the organization's facilities?	16
		Has facilities maintenance been given priority status within the organization, as evidenced by	

		top-level decision-makers' commitment to read this planning guide and refer to these guidelines while planning and coordinating facilities maintenance?	18
		Do the organization's facilities maintenance "decision-makers" include school administrators, facilities/custodial representatives, teachers, parents, students, and community members?	18

Additional Resources

Every effort has been made to verify the accuracy of all URLs listed in this guide at the time of publication. If, however, a URL is no longer working, please use the root directory to search for a page that may have moved since the release of this guide. E.g., if the link to http://www.epa.gov/iaq/schools/performance.html is not working, try http://www.epa.gov/ and search for "IAQ".

Facilities Resources… Just a Mouse Click Away

The National Clearinghouse for Educational Facilities (NCEF) is the nation's primary source of comprehensive information about school planning, design, financing, construction, modernization, and maintenance issues. NCEF's website, which can be found at http://www.edfacilities.org, includes...

Resource Lists – current, subject-specific, compilations of information on more than 100 school facilities topics. The lists include links to online publications and related websites, as well as descriptions of books, studies, reports, and journal articles.

Publications – concise explorations of facilities-related subjects and issues that concern educators and affect learning. Available in paper copies or online.

News – summaries of local, regional, and national developments regarding educational facilities, including links to online news stories and related NCEF information resources.

Calendar – complete and timely information on regional and national events related to school facilities.
Gallery – photographs and project information on award-winning school designs.

Construction Data – statistics on nationwide school construction activity, with links to sources of school construction and cost estimating data.

Ask A Question – responses by NCEF reference staff to school facilities questions submitted via online question form. Queries answered within two to four business days.

Newsletter – highlights of the most recent NCEF publications, events, and news sent to users periodically through an e-mail publication called EdFacilities Updates.

Links – links to professional organizations, federal, state and municipal resources, academic research centers, media, and products and services.

Search – direct access through keyword or phrase to NCEF's extensive database of information about school facilities.

So whether you are searching for information about capital improvement programs, indoor air quality, or school size and security, visit the National Clearinghouse for Educational Facilities at http://www.edfacilities.org (or call toll free: 888-552-0624).

Deteriorating School Facilities and Student Learning
http://www.ed.gov/databases/ERIC_Digests/ed356564.html
This document reports that many facilities in American public schools are in disrepair—a situation with implications on the morale, health, and learning of students and teachers. Frazier, Linda M. (1993) ERIC Clearinghouse for Educational Management, Eugene, OR.

Educational Performance, Environmental Management, and Cleaning Effectiveness in School Environments
http://www.carpet-rug.com/pdf_word_docs/0104_school_environments.pdf
This report demonstrates how effective cleaning programs enhance school and student self image, and may promote overall higher academic attendance and performance. Berry, Michael A. (2001) Carpet and Rug Institute, Dalton, GA.

Facilities Information Management: A Guide for State and Local Education Agencies
http://nces.ed.gov/forum/publications.asp
A publication from the National Forum on Education Statistics that defines a set of data elements that are critical to answering overarching policy questions related to elementary and secondary school facility management. Facilities Maintenance Task Force, National Forum on Education Statistics (2003) National Center for Education Statistics, Washington, DC.

Impact of Facilities on Learning
http://www.edfacilities.org/rl/impact_learning.cfm
A list of links, books, and journal articles examining the association between student achievement and the physical environment of school buildings and grounds. The National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality and Student Performance
http://www.epa.gov/iaq/schools/performance.html
This report examines how indoor air quality (IAQ) affects a child's ability to learn, and presents case studies about schools that have successfully addressed their indoor air problems, the lessons they learned from the experience, and what long-term practices and policies emerged from the efforts. Indoor Environments Division, U.S. Environmental Protection Agency (2000) U.S. Environmental Protection Agency, Washington, DC.

Maintenance & Operations Solutions: Meeting the Challenge of Improving School Facilities
http://www.asbointl.org/Publications/
This paper examines the impact current maintenance and operations (M&O) practices have on U.S. school performance and offers possible avenues for improvement through the judicious use of technology and improved methodology. Facilities Project Team, Association of School Business Officials International (2000) Association of School Business Officials International, Reston, VA.

Chapter 2

Planning for School Facilities Maintenance

An essential component of an effective school program is a well-conceived school facilities maintenance plan. A properly implemented plan provides school administrators comfort and confidence when contemplating the future of their campuses.

Table of Contents:

Goals:

- ✓ ***To explain why planning is an essential component of managing school facilities maintenance activities.***
- ✓ ***To communicate that effective facilities management requires the support of many stakeholders throughout the organization and community.***
- ✓ ***To confirm that informed decision-making demands ready access to high-quality data that describe the status of the organization's facilities, needs, and capabilities.***

The Best Of Intentions Don't Keep The Schools Running

The school facilities belonged to Ted, or so you'd think from the devoted way in which he cared for them. He was the head of the facilities maintenance department and took great pride in the condition of the school district's buildings and grounds. He'd done a fabulous job for nearly 30 years and knew the needs of the district like the back of his hand. But now there was a new sheriff in town. The superintendent Ted had worked with for most of career had finally retired and a new person had been hired. Ted had briefed her on the status and future of the facilities she had inherited and listened politely when she told him about her own five year plan. Ted hadn't agreed completely with her assessment of the future, but thought that he'd give her a year or two to learn on the job. Six months later, Ted was tremendously upset when he found out that the district was closing his favorite old elementary school. He'd never thought the superintendent would actually do it and had repeatedly ignored her warnings… choosing instead to revamp the facility for 21st Century instruction so that he could make a case for keeping the beautiful old building when the time came. In fact, when news of the building's retirement arrived, he went straight to the superintendent to tell her that it was a bad decision, but to no avail. She explained to him that demographic reports showed that the school wouldn't be able to meet the needs of the growing population and that funds had already been allocated for a new building. The school supervisors were on board, she was on board, and it was time for Ted to get on board. Ted took a deep breath, swallowed his pride, and realized that the team had a new boss—and if he was going to be a team player, he had to align his work with the her goals. Their efforts had to be coordinated. It was as simple as that.

Effective Management Starts With Planning

Unless facilities maintenance planning is a component of a greater organizational management plans, it is doomed to failure. After all, how else can maintenance planners be certain that other policy makers share their priorities? Or that funds will be available to achieve their goals? And how else would they learn about demographic and enrollment projections and the ensuing changes in building demand? Thus, it is critical that facilities maintenance planning be an element of the overall organizational strategy… part of the "master plan".

The master plan is the "blueprint" for daily decision-making throughout a school district. It provides concrete documentation about the organization's needs and intentions. Moreover, it is a formal way of communicating the district's priorities, and establishes necessary documentation for funding authorities and other approving organizations. Good plans include short- and long-term objectives, budgets, and timelines, all of which demonstrate organizational commitment to facilities maintenance. Effective planning also requires that planners evaluate both the organization's overarching goals (see Creating a Unified Organizational Vision below) and the day-to-day details needed to meet those targets. Thus, a comprehensive plan serves as a blueprint for the here and now and a roadmap to the future!

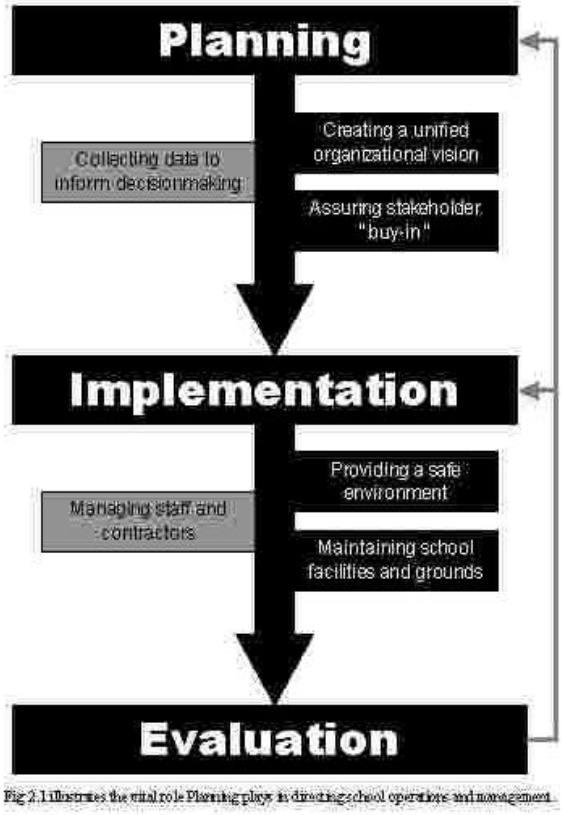


Fig 2.1 illustrates the vital role Planning plays in directing school operations and management

Management must ensure that:

- ✓ ***Appropriate policies are established, documented, and implemented.***
- ✓ ***Applicable regulations are identified and followed during both decision-making and implementation.***
- ✓ ***Budgeting and purchasing are handled in a realistic and responsible manner (i.e., it costs money to do things right, like disposing of hazardous materials in a proper and timely manner).***

> ***"Planning" is the formulation of a strategy for getting an organization from the here and now to the future. As circumstances change over time, strategies for achieving tomorrow's successes often change as well. Good planners are always mindful of the need to review, and even revise, plans to meet the changing needs of the organization.***

Having said this, however, planners must also accept that the future is not now (despite the adage that suggests differently). In other words, change takes time, and improvements in organization-wide endeavors most often occur in steps. If a school district finds itself in need of a major overhaul in its facilities maintenance management system, it cannot expect to jump to the head of the field in one or two years. Instead, planners must institute improvements over longer time frames and accept that progress is measured relative to an organization's starting point rather than by comparisons with other organizations that may or may not be working under comparable circumstances.

Developing a Facilities Maintenance Plan requires…

1) ***Involving stakeholders in the planning process***
2) ***Identifying needs (e.g., improving cleanliness and safety, correcting deficiencies, addressing deferred projects, increasing efficiency, decreasing utility bills)***
3) ***Establishing priorities and targets***
4) ***Collecting and using supporting data to inform decision-making***
5) ***Sharing the plan to garner support from management and key stakeholders***
6) ***Allocating funds to pay for planned activities***
7) ***Training staff to implement planned activities***
8) ***Implementing the plan***
9) ***Being patient while awaiting cost savings or other results***
10) ***Evaluating the plan in a systematic manner***
11) ***Refining efforts based on evaluation findings***
12) ***Reviewing and revising the plan on a periodic basis (e.g., every three years)***

Why Collaborate During Planning (and With Whom)?

> ***Why include stakeholders in the planning process?***
>
> ***(1) To hear new ideas and perspectives;***
> ***(2) To demonstrate that planners value stakeholder opinions;***
> ***(3) To increase the likelihood that stakeholders will "buy in" to the plan.***

In many ways, the process of planning is more important than the outcome. The process of formulating a plan establishes a forum through which interested parties have a chance to voice their opinions about the future of the organization. This opportunity, and the dialogue (and even debate) that ensues, is an effective way of infusing fresh ideas and new perspectives into school management. Collaborative planning also helps stakeholders feel that their views are respected and valued. In turn, this atmosphere of respect

usually fosters staff and community support for the decisions being made about the future direction of the organization (and, perhaps more importantly, the day-to-day steps that must be taken to achieve these goals).

Who is involved in the planning process? Ideally, stakeholders include anyone who has a "sense of ownership" in facilities decision-making, even though they might not have any legal rights (or even expectations) to make decisions about school facilities and property. As the list of stakeholders grows larger, it often makes sense to include representatives of stakeholder groups (rather than every individual) as long as the selection process is conducted in a fair an equitable manner.

Be prepared to deal with inconvenienced stakeholders… E.g., If major renovations are scheduled for public fields, efforts should be made to find alternative sites for community use.

Steps for effectively engaging stakeholders in the planning process include:

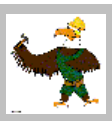
- ✓ Identify all stakeholders (a list of candidates can be found in the table below).
- ✓ Determine the best way(s) to extend invitations to targeted stakeholders to share their opinions during the planning process (e.g., via newspaper ads, Websites, or direct mail).
- ✓ Contact stakeholders well in advance of the planning meetings.
- ✓ Enter a dialogue that truly welcomes stakeholders' opinions.
- ✓ Invite stakeholders to share unique skills and expertise they bring to the table (e.g., you may have engineers, architects, or landscapers in the PTA who could lend their expertise).
- ✓ Foster a consensus-building atmosphere.
- ✓ Recognize dissent as necessary, but do not allow it to derail consensus building.
- ✓ Include stakeholders in follow up documentation and implementation efforts.

Opinions Welcome: Stakeholders and the Planning Process

Potential stakeholders in the planning process include, but are not limited to:

Maintenance Staff/Contractors	*Parents*	*Students*
Custodial Staff/Contractors	*PTA Representatives*	*Community Groups/Users*
Superintendent(s)	*Taxpayers*	*Foundation Representatives*
Principal(s)	*School Board Members*	*Public Safety Officials/Regulators*
Teacher(s)	*School Business Officials*	*City/County Planners*
Department of Education Staff	*Partners (joint use facilities)*	*Dept. of Environmental Quality Staff*
*Againsters**	*Other Government Officials*	*Expert consultants (e.g., architects, engineers, demographers, attorneys)*

** Againsters are those people who make a habit of opposing any kind of change. In order to minimize the likelihood of last minute delay tactics, planners must include these stakeholders in the decision-making process from its onset.*



Experts in Residence: Maximizing Community Resources

Although Valley School District was fairly small, its facilities needed to be maintained all the same. In fact, the facilities management planning team had worked very hard to devise a strategy that would ensure a sound future for the district's grounds and buildings. Three parents, two teachers, a vice principal, an assistant superintendent, a school board member, the PTA President, the mayor's assistant, the facilities manager, his assistant, and a custodian all came to a consensus regarding the major points of the plan. When the report went to the superintendent, she was very impressed. She addressed the group at their next meeting, stating that the plan sounded very good in principle, but noted that she would recommend a delay of several weeks in order to get expert review from construction and insurance specialists. The facilities manager politely interrupted her, "Excuse me, ma'am, but I don't think we need to do that." The superintendent looked at him with surprise. "Why Edward, you've had your chance to use your expertise when developing the plan, but it's my professional opinion that the report needs to be reviewed by specialists outside of the field of facilities management as well." "Oh, I agree about that," Edward responded, "I just wanted to let you know that we've already gotten input from an insurance agent and a developer, and we didn't need to pay for it either." "You did?" the superintendent asked, "How?" "Well," Edward answered looking toward the planning team members, "Mr. Jackson, who has a child in the high school, is a developer, and Mrs. Ramirez, the PTA President, is a commercial real estate agent. What's more, Mrs. Allen, who is also a parent, is an accountant, and she's verified that all of our financial projections are sound." The superintendent looked at the group, "My goodness, you've done a thorough job. And efficient too." She looked to the community volunteers in particular, "We owe you thanks not only for your time, but also your expertise." The facilities manager smiled, knowing that he and his team had done a good job, and that they had maximized their community's resources to benefit the district. The project would go on without delay or additional expense.

Creating a Unified Organizational Vision

vision \ vizh-?n \ *n* : the act or power of seeing; unusual discernment or foresight <a person of ~>.

A vision statement is a proclamation of how an organization, department, group, or individual wants to see itself in the future.

After planners (including stakeholders) have been identified, the first and most important step in the planning process is achieving agreement on the desired outcome of the organization's labors—i.e., what is the group hoping that the plans will lead to in the future? A good way of clarifying and specifying these expectations is through the development of a vision statement. A vision statement is a proclamation of how an entity wants to see itself in the future. An individual can have a vision statement, as can a department, group, or even an entire organization. The reason for creating a vision statement is to develop a shared image of the future, which means gaining consensus about priorities. Thus, if an individual or department has a vision for its future, it cannot conflict with the vision of the larger organization within which the person or people must work. The vision for the Facilities Maintenance Department, for example, must be driven by, and aligned with, the explicitly stated mission and goals of the district it serves, or else the facilities manager and

school superintendent will come into conflict—which is not good for the school district and never good for the facilities manager!

'CLEAN' IS A RELATIVE TERM

Your local high school can be cleaned by a single person… no kidding. The only catch is that you have to be willing to live with the job that would be done. Thus, it is imperative that there be agreement on expectations. Somebody is bound to be unhappy if parents expect 4-star hotel conditions but planners only budget for discount motel standards.

Some administrators might argue that the goal of the maintenance department is simply that of the greater district it serves. However, it becomes difficult to operationalize such a "vision" that is not closely related to the day-to-day operations of the department. Thus, it is good practice for the Facilities Department to collaborate with representatives of the rest of the organization when generating consensus about its vision but, at the same time, to create a vision that directly relates to its day-to-day activities.

Examples of Unclear and Clear Vision Statements for a Facilities Maintenance Department

#1) Unclear: *The Facilities Maintenance Department will contribute to the School District's mission of educating our children to meet the intellectual, physical, and emotional demands of the 21st Century.*

While commendable in its intent, this vision statement is unclear. It provides little direction for day-to-day decision-making about the operations of the Facilities Maintenance Department.

#2) Clear: *The Facilities Maintenance Department will provide a clean, orderly, safe, cost-effective, and instructionally-supportive school environment that contributes to the School District's mission of educating our children to meet the intellectual, physical, and emotional demands of the 21st Century.*

This vision statement includes a clear and succinct description of the Facilities Maintenance Department's role in the District's overall mission. It provides a target (a clean, orderly, safe, cost-effective, and instructionally-supportive school environment) that can direct day-to-day activities.

A vision statement should be a living document, but not short-lived. Otherwise, it can't inform long-term decision-making and investment. All the same, a vision statement must be reviewed regularly to ensure that it stays relevant to the potentially changing needs of the organization. Vision statements don't solve every problem. Investing time in creating a vision statement can save energy in the long run by reminding staff of their priorities, but it is not an answer in itself—the work of maintaining a building still needs to get done. The vision statement merely (but not unimportantly) sets the goal against which policies, practices, and efforts will be evaluated. Thus, in order to assess efforts intended to achieve this goal, the vision statement should be supported by measurable objectives.

Although a vision statement should be of a lasting nature, it must be revisited periodically in order to verify its continued relevance in an ever-changing world.

The National School Boards Association's online toolkit for "Creating a Vision" (http://www.nsba.org/sbot/toolkit/cav.html) recommends that when creating a vision statement, it helps to:

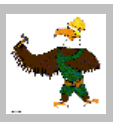
- ✓ Describe an *ideal* future for the organization
- ✓ Think about the organization's best interests and not individual or department interests
- ✓ Stretch one's thinking
- ✓ Be open to change (including substantial change if that is what is deemed to be necessary)
- ✓ Be positive and inspiring
- ✓ Be clear

Creating a "vision" requires creating an atmosphere of creativity. Brainstorming, free-thinking, and open mindedness are essential aspects of an honest assessment of an organization's desired future.

Moreover, when creating a vision statement, it is important to avoid:

- × Closed-mindedness
- × Selfishness
- × Short-term thinking
- × Complacency
- × Fear of change
- × "Reality" (e.g., "we don't have the budget for that anyway")
- × Parochialism
- × Disrespect
- × Partisanship
- × Infighting
- × Apathy

What does your community value? The appearance of your community's school buildings says a lot about its values. Some communities have gone one step further and actively planned for their schools to reflect greater community values. For example, one school district in Utah requires that art museums and climbing walls be included in all new school construction in order to reflect the community's belief in the importance in art, exercise, and nature.



What A Shared Vision Can Accomplish

An elementary school created a vision statement that emphasized each child learning how to read. The development process included comprehensive input from staff, students, and community members. Moreover, planners went to great efforts to publicize the vision within the school and community. Several days after the kick off ceremony for the school's Vision for the 21st Century, the principal noticed that labels had appeared on objects throughout the school. The water fountains were marked "water fountain", the fire extinguishers were labeled "fire extinguisher", and the smoke detectors were marked "smoke detector". When the principal inquired about the phenomenon, the school custodian admitted that he had posted the labels as his contribution to helping the children learn how to read—and the principal immediately knew that the team approach to developing and publicizing the school's vision statement had been a success.

Examples Of Model School Facilities Maintenance Vision Statement Phrases

- **maintain a healthy school environment**
- **ensure the appropriate use of school space for educational practices**
- **maximize facility use (e.g., nights and weekends) to optimize investment**
- **guarantee equitable allocation of educational resources**
- **create and maintain a physical environment that supports the needs of the academic program, staff, students, other users and visitors who utilize the campus**
- **operate, maintain, and promote quality facilities, grounds, and services to efficiently and effectively support the instructional and service programs**
- **provide the physical environment, utilities, and support services necessary to promote educational activities**
- **maintain buildings, grounds, and equipment that are fundamental to a healthy academic environment**
- **provide an atmosphere that allows students, faculty, and staff to meet or exceed their personal and departmental goals that support the academic mission of the schools**
- **supply appropriate environmental services in the most efficient and economical manner**
- **promote a safe, clean, aesthetically pleasing campus environment**
- **respond to the environmental needs and requirements of the school district**
- **provide an optimum learning, teaching, and working environment for all students, faculty, and staff within the school community**
- **sustain the integrity and appearance of the campus environment while supporting the pursuit of the educational process**

For more information about creating a vision, visit the following Web pages: Creating a Vision (National School Boards Association) at http://www.nsba.org/sbot/toolkit/cav.html; A Visioning Process for Designing Responsive Schools (National Clearinghouse for Educational Facilities) at http://www.edfacilities.org/pubs/sanoffvision.pdf; and Community Participation in Planning (National Clearinghouse for Educational Facilities) at http://www.edfacilities.org/rl/community_participation.cfm.

Links to Budgeting & Planning

This is not a capital planning guide, but any responsible examination of school facilities planning warrants some discussion about the links between facilities maintenance and facilities construction and renovation. For example, capital outlay for

school construction is generally a more palatable proposition for taxpayers and public officials when a school district demonstrates that appropriate care and maintenance has been given to existing facilities. A corollary to this realization is also relevant—inadequate or deferred maintenance leads inevitably to increases in future capital outlay needs.

Moreover, responsible facilities maintenance planning demands that attention be given to a wide range of other issues that influence organizational budgeting, including insurance coverage, land acquisition, equipment purchase, and building construction and renovation. While it is not the purpose of this planning guide to discuss these issues in detail, links to other resources that address these and other budgeting topics can be found at the end of this chapter.

While budgeting and capital planning are not the purpose of this planning guide, links to other resources that address these and other budgeting topics can be found at the end of this chapter.

Facilities Managers, Good Accountants, and Common Sense will tell you that…

The maintenance and operations budget is for existing facilities and equipment. Capital project funding must come from other sources. This includes paying for staff time. Otherwise, maintenance on existing facilities will be neglected every time there is a construction or renovation project because the maintenance staff will be drafted into service on capital improvements.

For more information about maintenance costs and budgeting, visit the following Web pages: Budgeting for Facilities Maintenance and Repair Activities at http://www.nap.edu/books/NI000085/html/index.html and Maintenance and Operations Costs at http://www.edfacilities.org/rl/mo_costs.cfm.

Data for Informed Decision-Making

Good data are necessary to inform good decision-making. It is as simple as that. Thus, facilities maintenance plans should be based on a foundation of high-quality data about all school facilities. Otherwise, planners are forced to work without context, and strategic planning becomes strategic guesswork. Planners must know what facilities exist, where they are located, how old they are, and their status/condition. Are equipment and facilities working as designed? As they should? As they need to be?

District facility and operation plans need to address data collection and use as a part of an overall management and policy tool. While there are political realties both internal and external to any organization, having "the facts" (i.e., good data) is rarely a bad idea.

Informed decision-making requires ready access to high-quality data that describe the status of the organization's facilities, its needs, and capabilities.

Additionally, planners must consider projected needs for the future. For example, demographers provide important data about the growth of student populations—e.g., how many students will be in each neighborhood over the next decade. The only way to ensure that planners have the information they need to make effective decisions is to collect the data in a regular, timely, and consistent manner. Data collection is a time-consuming and ongoing task that cannot be overlooked. As a matter of efficiency, it may make sense for an education organization to partner with other entities that share their interest in data, including, for example, the local Chamber of Commerce, the state government, or even real estate companies. Chapter 3, *Where to Begin (Knowing What You Have)*, is focused on the issue of facilities audits and data collection, which should be an area of focus for responsible facilities managers. Moreover, the National Forum on Educational Statistics has developed a companion to this planning guide, titled *Facilities Information Management: A Guide for State and Local Education Agencies*, to help address these issues. It can be downloaded at http://nces.ed.gov/forum/publications.asp.

Planning + Information = Success

Good Maintenance

… is pro active

… is a team effort

… is based upon preventive maintenance

… is money well spent

… will reduce the life cycle cost of the building

… is in the best interest of the taxpayer

… complements educational objectives

… is not a secondary aspect of education

Commonly Asked Questions

Why plan for school facilities maintenance? Facilities maintenance doesn't occur in a vacuum. After all, grounds and buildings belong to school districts, not maintenance departments, so their use must first and foremost support the mission of the district. The maintenance department's job is to ensure that all facilities and grounds are in adequate condition to serve that purpose. Thus, it is imperative that day-to-day maintenance activities be guided by a school facilities maintenance plan that is informed by, and aligned with, greater organizational planning. Without a coordinated plan, it is impossible to know whether day-to-day maintenance operations support current and future organizational priorities.

Why should an organization go to the trouble of including stakeholders in facilities maintenance planning? Stakeholder feedback provides new perspectives and fresh ideas to the planning process. Moreover, when stakeholders participate in organizational planning, it increases the likelihood that they will buy into the strategies that *they* have helped to establish. "Buy-in" becomes especially significant when one recognizes that likely stakeholders in the facilities maintenance planning process include maintenance and custodial staff, teachers, parents, students, superintendents, principals, board members, school business officials, and community groups.

Why should an organization bother to develop a "vision statement" for facilities maintenance? A vision statement helps to focus facilities maintenance policies, procedures, and day-to-day operations on the needs of the greater organization. Without a vision statement (the target), management risks inefficient use of resources by squandering time, money, and effort on activities that are not consistent with the long-term needs of the organization. Moreover, a well-publicized vision statement reminds staff at all levels of the overarching purpose of their work.

Who reads a vision statement? Hopefully lots of people, but that is a function of how well the organization disseminates the vision statement. Like any "statement", a vision statement only works when it is read. Thus, it is important that the vision statement be shared with every person who maintains, supports, or uses school facilities. If stakeholders are aware of the organization's vision for its future, they can align their long- and short-term plans that direct day-to-day activities in support of that vision.

Planning for School Facilities Maintenance Checklist

More information about accomplishing checklist points can be found in the text on the page listed in the right hand column.

Accomplished		Check Points	Page
Yes ✓	No ✗		
		Is there a facilities maintenance plan?	27
		Does the facilities maintenance plan include a long- and short-term objectives, budgets, and timelines?	27
		Have potential stakeholders in the facilities maintenance planning process been identified?	29
		Have appropriate avenues for publicizing the	

		facilities maintenance planning process to staff and community stakeholders been investigated and undertaken?	29
		Have representative members of stakeholder groups been invited to participate in the facilities maintenance planning process?	29
		Have representative members of stakeholder groups been selected fairly for participation in the facilities maintenance planning process?	29
		Have individual views and opinions been a welcomed aspect of the consensus-building process?	29
		Have stakeholders been included in follow up efforts to document and implement decisions?	29
		Has a vision statement for school facilities maintenance been constructed?	30
		Is the vision statement for school facilities maintenance aligned with the vision and plans of the rest of the organization?	30
		Is the vision statement closely related to the day-to-day operations of the facilities maintenance staff?	31
		Has the vision statement, and the rationale behind it, been communicated to all stakeholders?	31
		Is facilities maintenance planning a component of overall organizational planning?	34
		Have comprehensive, accurate, and timely school facilities data been used to inform the planning process (see also Chapter 3)?	34

Additional Resources

Every effort has been made to verify the accuracy of all URLs listed in this guide at the time of publication. If, however, a URL is no longer working, please use the root directory to search for a page that may have moved since the release of this guide. E.g., if the link to http://www.epa.gov/iaq/schools/performance.html is not working, try http://www.epa.gov/ and search for "IAQ".

A Visioning Process for Designing Responsive Schools
http://www.edfacilities.org/pubs/sanoffvision.pdf
A guide for helping students, teachers, parents, administrators, and community members set the groundwork for designing and building responsive, effective, community school facilities. The document explains the benefits of community participation and tells how to go about the process of strategic planning, goal setting, visioning, design generation, and strategy selection. Sanoff, Henry (2001) National Clearinghouse for Educational Facilities, Washington, DC, 18p.

American School and University Annual Maintenance and Operations Cost Study
http://images.asumag.com/files/134/mo%20school.pdf
This annual survey reports median national statistics for various maintenance and operations costs, including salary/payroll, gas, electricity, utilities, maintenance and grounds equipment and supplies, outside contract labor, and other costs.

Budgeting for Facilities Maintenance and Repair Activities
http://www.nap.edu/books/NI000085/html/index.html

An online publication focused on how to estimate future facility maintenance and repair needs. Federal Facilities Council, Standing Committee on Operations and Maintenance, National Research Council (1996) National Academy Press, Washington, DC.

Creating a Vision
http://www.nsba.org/sbot/toolkit/cav.html
An online toolkit from the National School Boards Association for creating a vision in school organizations.

Community Participation in Planning
http://www.edfacilities.org/rl/community_participation.cfm
A list of links, books, and journal articles about how community members can become involved in the planning and design of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Maintenance and Operations Costs
http://www.edfacilities.org/rl/mo_costs.cfm
A list of links, books, and journal articles citing national and regional maintenance and operations cost statistics and cost reduction measures for the upkeep of school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Maintenance Planning, Scheduling and Coordination
This book focuses on the preparatory tasks that lead to effective utilization and application of maintenance resources: planning, parts acquisition, work measurement, coordination and scheduling. Nyman, Don and Levitt, Joel (2001) Industrial Press, New York, NY, 320p.

The Rural and Community Trust
http://www.ruraledu.org/facilities.html
The Rural Trust works with many small rural towns and counties in which the school remains the center of the community. It recognizes the challenge and the promise of creating facilities that serve schools and communities. To meet that challenge it has started a network of people working to improve school-community facilities, increase community participation in the facilities design process, and expand the stakeholders these public resources can serve.

Chapter 3

Facility Audits: Knowing What You Have

Facility audits require time, energy, expertise and, therefore, resources. Performing a comprehensive and accurate audit will not be cheap, but it is economical all the same, as it is a necessary step in the effective and efficient management of school facilities.

Table of Contents:

Goals:

- ✓ ***To convey the importance of inventorying buildings, grounds, and equipment.***
- ✓ ***To explain how best to collect, manage, and use facilities data from a facility audit.***

Let's Get Our Stories Straight…or Maybe It's Better that We Don't

Two-thirds of the audit team pulled into the parking lot at the high school. Before the maintenance supervisor and a local structural engineer could get out of their car, the building principal greeted them, anxious to join the other facility experts for the audit. On their way into the building, the principal pointed at the well-worn sill on a bank of windows outside the gymnasium. "We'll have to put that window sill on the list as being in need of painting," he noted perfunctorily. "Actually," the maintenance supervisor replied, "that job is going to require scraping and maybe even power washing… It's more than just a simple maintenance job, so we'll mark it as thirty feet of a ten dollar per foot improvement project." The structural engineer looked critically at the roof above the window sill. "In my opinion, we've got to consider the possibility of a failed lintel due to a damaged roof truss and undersized roof drain. We'll need to look at it a lot more seriously to be sure." The principal scratched his head, "You know, I was really only concerned about how it looked." The maintenance supervisor nodded, "And I was only worried about what it would cost to fix." But the structural engineer was quick to interrupt him, "And you might very well be correct with your assessment, but the only way to be certain is to check that truss and drain." "Well," the principal smiled, "I guess that three sets of eyes are better than one." "Especially when each sees the world from a different perspective," laughed the maintenance supervisor. "That's right," the engineer agreed, "I'm the theorist." He looked at the maintenance supervisor, "You're the realist. And you, Mr. f, represent the bottom line."

Why Audit Your Facilities?

Things change. It is a fact of life and of school facilities maintenance planning. The luster of new buildings and equipment are sure to fade over time. And as facilities age, their condition will change as well. Perhaps surprisingly, change isn't always a bad thing. For example, a two-year old air handling system might perform better than a new system because its operators have had 24 months to learn how to use it and "get out the kinks". Of course, this assumes that the operators have bothered to maintain the equipment responsibly along the way, which probably means changing filters and belts over the course of the two years. If, however, the same air handler is operating well after ten years of service, it is safe to assume that more extensive maintenance efforts have been undertaken as well—valves and gaskets must have been replaced and the compressor pump serviced (probably more than once). Thus, the definition of what constitutes "proper maintenance" changes over the life of the equipment or building, and knowing the age and status of one's facilities is a prerequisite for maintaining them properly. If you know the condition of your facilities, then you have a chance of knowing what needs to be done to maintain and repair those facilities. Otherwise, maintenance efforts are, by definition, a hit-or-miss situation—some things only get fixed when they are broken and others get "maintained" on a routine basis whether or not they need it. On the other hand, if an organization knows the status of its facilities, the need for maintenance, repair, and upgrades becomes much more clear… after all, it is tough to argue against the data!

The definition of what constitutes "proper maintenance" changes over the life of the equipment and building, and knowing the age and status of one's facilities is a prerequisite for maintaining them properly.

Knowing the Condition of Your Facilities

Facility Audits:

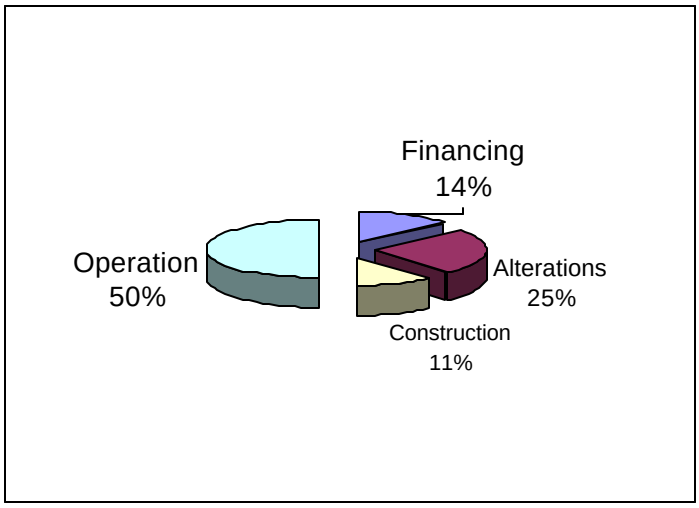
- ✓ *Help planners, managers, and staff know what they have, what condition it is in, its service history, its maintenance needs, and where it is located.*
- ✓ *Provide facts, not guesswork, to inform plans for maintaining and improving school facilities.*
- ✓ *Establish a baseline for measuring facilities maintenance progress.*
- ✓ *Allow for in-depth analysis of product life cycles to occur on a routine basis (i.e., measuring actual life versus expected life).*

A facility audit (inventory) is a comprehensive review of a facility's assets. Facility audits are a standard and proven method for establishing baseline information about the components, policies, and procedures of a new or existing facility. An audit is a way of determining the "status" of the facility' at a given time—i.e., a *snapshot* of how the various systems and components are operating. Moreover, a primary objective of a facility audit is to measure the decrease in value of an aging asset relative to the cost of replacing that asset. Thus, facilities audits are tools for projecting future maintenance costs.

The terms "audit" and "inventory" are often used interchangeably—the former referring to the "act of inspecting" and the latter to the "act of recording". These guidelines will use the term "audit" to refer to both inspecting and recording in a general sense.

Facilities audits are accomplished by assessing buildings, grounds, and equipment, documenting the findings, and recommending service options to increase efficiency, reduce waste, and save money. Thus, an audit provides the landscape against which all facilities maintenance efforts and planning will occur.

Lifecycle Costs: More than Just the Sticker Price



The initial cost of purchase does not represent the true cost of a piece of equipment throughout its lifetime. Planners must consider lifecycle costs because, in many cases, the real cost of an asset throughout the 40 years of a facility's life breaks down as follows: construction 11%, financing, 14%, alterations 25%, and operations 50%. Source: HVAC Applications (1999) American Society of Heating, Refrigeration, and Air Conditioning, Atlanta, GA.

Facility audits should be a routine part of the facilities maintenance program. However, they are often precipitated by the information needs of upper management, the community of taxpayers and voters, and legislative or regulatory bodies. By integrating the findings of annual audits over time, planners can ascertain realized (versus expected) product life cycles, the impact of various maintenance strategies and efforts on product life cycles, and the future demands the aging process might place on the infrastructure of a school district. Moreover, this information can be used to increase the efficiency and cost-effectiveness of facility use and maintenance efforts in the future.

Range of Expected Equipment Service Life

Equipment Item	Expected Years	Actual Years*
A/C Window Unit	10 – 15	?
Steel Water-Tube Boiler	24 – 30	?
Wood Cooling Tower	20 – 25	?
Lighting Ballasts	7 – 10	?
Emergency Battery	5 – 7	?
Carpet	12 – 15	?

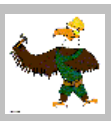
**** Only an audit will provide the data to complete the third column.***

Note that factors such as location (e.g., in or out of direct sunlight), environmental conditions (e.g., humid or dry air), and actual use (e.g., optional use rather than recommended use) can also affect expected service life.

Why does an organization need to collect high quality facilities data?

Because facilities data can be used to:

- ✓ **determine the state and condition of the facility…** because without collecting information, assessing an entity's condition is simply guesswork.
- ✓ **establish a baseline for measuring change…** such trend analysis (are things getting better or worse?) is only possible if the assessor has information about how things used to work at some previous point in time.
- ✓ **assess progress…** after all, "progress" is a relative term that has meaning only in the context of baseline measurements.
- ✓ **predict and model the impact of modifications…** so that systems analysis can be extended to predictions of future performance when based on quality data and sound modeling methods.
- ✓ **assist in decision-making for repairs, renovation, or abandonment…** because nothing "informs" sound decision-making like "information"!
- ✓ **report district information in state and federal data collections/assessments…** which often include funds associated with reporting requirements.
- ✓ **populate Geographic Information Systems (GIS)…** and inform new school site selection and other planning decisions.
- ✓ **justify a bond initiative…** because a bond initiative is simply a special type of decision that needs to be made (and nothing strengthens an argument like supporting "facts" based on data).



The Case of the Red Hot Classrooms

Eileen, the school facilities manager, had a problem. Most of the classrooms in the district's new science and technology magnet school were, to put it simply, hot. Eileen and her top-notch staff were stumped. They had verified that the chiller and components of the HVAC system were in working order, but the system kept getting overworked… and the rooms kept getting uncomfortable. Eileen studied the building specs time and time again, but it was to no avail. The data made sense: the HVAC system fit the square footage and two hundred student capacity in the building. What was wrong? Did she have bad data? What else could it be? She logged into the classroom inventory database. Sixteen students per room, one teacher, one aid, two doors, six windows, tile floors, six electrical sockets, eight computers… and the light bulb finally went off! "That's it," she yelled aloud to her assistant. "The computers--they give off heat just like a person does, and that means that each classroom has the equivalent of 26 people in it, not 18. That's the extra load." And sure enough, when Eileen did her follow up research on the Internet, she learned that the "average" child and "average" computer and monitor both occupied about 30 ft^2 and emitted 300 btu per hour. So her data were sound after all, and they had helped her to solve the mystery of the red hot classrooms!

How to Conduct Facility Audits

A facility audit is a data collection, pure and simple. The aim of the audit is to conduct a *comprehensive* inventory that meets the needs of the entire district management effort—i.e., facilities, technology, and curriculum planners—in a coordinated manner and thereby avoiding the need for redundant collection efforts.

data \`dat-?\ *n* : factual information (as measurements, observations, or statistics) used as a basis for reasoning, decision-making, or calculation.

Who Collects the Data?

The first step in the auditing process is to determine whose perspective will guide the audit. Auditors can take the shape of many types of personnel, some of whom are from within the organization and others who may be hired as consultants. Resources play a large role in this decision. Small districts may not be able to hire an auditing specialist whereas larger organizations might employ several. Above all, auditors must possess a thorough understanding of facility maintenance and operations and have the time they need to perform the task properly. Intangible

Good auditors are inquisitive, detail-oriented, and methodical. They possess a thorough understanding of facility maintenance and operations and have been given adequate time to perform the task properly.

characteristics include having an inquisitive nature, being devoted to details, and possessing the patience to do the job thoroughly. Finally, the fact that facilities have such a substantial impact on educational practices requires that auditing teams understand the greater vision for how facilities are to be used for instructional purposes throughout the district on a daily basis.

Vision = What you HOPE

Plans = What you EXPECT

Data = What you KNOW

Regardless of the size of the school district and the organizational affiliation of the auditors, it is recommended that facility audits be carried out by teams of two or more people rather than by an individual. Although the auditor should understand the general workings of a school facility, he or she should be accompanied by personnel who are intimately familiar with the facility being studied (e.g., a custodian, maintenance staff member, or building principal who works in the facility on a regular basis). The team approach promotes several desirable outcomes, including: encouraging multiple perspectives on the condition of facilities (e.g., instructional, technical, financial, cultural); sharing expertise when making difficult judgment calls; corroborating and confirming decision-making; and cross-training staff for future auditing and facility management responsibilities.

Assigning Facilities Assessment Duties: Pros and Cons

Who do you call when you need a facilities audit?

☎ *User assessments are helpful, but most users lack expertise.*

☎ *Maintenance staff reviews are good, but many employees lack the time to accept "extra" responsibilities.*

☎ *Expert facilities consultants are usually very reliable, but tend to require a substantial investment of resources (i.e., they can be expensive).*

What Data Need to Be Collected?

After deciding upon an auditing team(s), the next step in planning for a facilities audit is to define the scope of work—i.e., how detailed and comprehensive is the collection to be, and what information needs to be gathered? The simple answer is "everything". This includes all facilities, infrastructure, grounds, staff (e.g., training and development courses attended), and equipment (e.g., boilers, HVAC systems, floor

finishes, plumbing fixtures, electrical distribution systems, heating and air conditioning controls, roof types, flooring, furniture, lighting, ceilings, fire alarms, doors and hardware, windows, technology, parking lots, athletic fields/structures, playground equipment and landscaping, and the building envelope). Other issues to consider during an audit include accessibility (ADA), clean air, asbestos, fire, occupant safety, energy efficiency, vandalism, and instructional efficiency (e.g., alignment with state and local classroom standards).

Defining a school, a classroom, or an instructional space can be a very tricky endeavor and is beyond the scope of this planning guide. For an exhaustive examination of facilities terms and definitions, visit http://nces.ed.gov/forum/publications and read "Facilities Information Management: A Guide for State and Local Education Agencies".

More specifically building components include, but are not limited to:

- ✓ Rooms
- ✓ Interior walls
- ✓ Interior doors
- ✓ Floors
- ✓ Plumbing
- ✓ Electrical systems
- ✓ HVAC systems
- ✓ Kitchens
- ✓ Hardware
- ✓ Egresses
- ✓ Communications equipment (audio, video, and data)
- ✓ Exterior envelope (e.g., walls and windows)
- ✓ Roof and roofing materials
- ✓ Foundations and basements

Think comprehensively…

- ✓ ***"Buildings" include not only school buildings, but also athletic facilities, tool sheds, and remote sites.***
- ✓ ***"Grounds" include not only unpaved (e.g., fields) and paved (e.g., parking lots), but also the pedestrian and vehicle traffic that typify them.***
- ✓ ***"Equipment" includes all vehicle fleets, from lawnmowers to school buses and other district-owned automobiles.***

Grounds include, but are not limited to:

- ✝ Courtyards
- ✝ Unimproved fields
- ✝ Athletic fields
- ✝ Playgrounds
- ✝ Parking lots
- ✝ Campus roads
- ✝ Signage
- ✝ Traffic patterns
- ✝ Trees, shrubs, etc.
- ✝ Landscaping

The term "grounds" also includes landscaping and grounds care, which affect not only the aesthetic nature of school property, but also water flow, energy use, and even personal safety.

Equipment includes, but is not limited to:

- ✓ Fixed equipment (e.g., motors, compressors, telephones, computers)
- ✓ Tools (e.g., lawnmowers, snow blowers, leaf blowers, drills)
- ✓ Vehicle fleets (e.g., buses, vans, trucks, cars)
- ✓ Supplies (e.g., motor oil, cleaning agents, pesticides, and other chemicals)

At a minimum, the audit should record the following:

- ✓ *What?*
- ✓ *Where?*
- ✓ *Identifiers (e.g., brand name, model numbers, serial numbers, etc.)*
- ✓ *Product size (e.g., size 4 or "medium") and quantity*
- ✓ *How old?*
- ✓ *What condition?*
- ✓ *Working as purchased/designed?*
- ✓ *Working as it should be?*
- ✓ *Working as it needs to be to meet the needs of the users?*
- ✓ *Repair history?*
- ✓ *Specialized upkeep requirements (e.g., oil and filter types)*
- ✓ *Evidence of future needs?*
- ✓ *Recommended service?*
- ✓ *Estimated remaining useful life?*

One can of gum and graffiti remover (a class 4 flammable) stored at a school site probably doesn't present much of a hazard. However, 10 cases in a single room is a different story—planners must get enough detail from an audit to see the difference!

Facilities audits should also include a review of facility records and reports so that precursors to potential concerns can be identified before they turn into full-blown problems (e.g., records indicating that filters have not been changed for nine months might suggest that Indoor Air Quality problems are on the horizon). Furthermore, comprehensive auditing should also look at the underlying practices and processes that support the maintenance of facilities. Doing so can help to ensure that "standard operating practices" are not only being planned as policy, but implemented as day-to-day procedures. Moreover, because some types of record keeping are regulated (e.g., maintenance records on the boiler, the amount and type of fuel used, the operation of emergency generators, and use of pesticides), auditing should verify that required records are being maintained.

Energy should also be included when conducting the inventory/audit—meaning that *all* elements of the building's structure and operation must be evaluated with respect to energy use. Building energy audits typically include computer-based energy modeling of the building. Once a base model is created to match existing building conditions, modifications can be introduced to the model in order to evaluate their impact on annual energy use. This approach especially makes sense when an older building is being evaluated to determine the ramifications of potential system upgrades. For example, an

audit and subsequent energy model can be used to predict the impact of lighting upgrades on a building's heating and cooling systems.

How do findings get recorded? That, of course, depends on the data collection system being used in the district. Options range from high-end software with electronic pick lists on palm pilots or laptop computers to low-end steno pads and pencils. Regardless of the recording mechanism, all data eventually need to be translated into an electronic format. If the data were collected electronically to begin with (e.g., on a laptop computer), they can be exported into a database or spreadsheet without much additional effort. If, on the other hand, the data were collected manually, they will need to be keyed into a database or spreadsheet. The process of keying and rekeying data is generally thought to be a significant source of error in any translation process. Rekeying data is also redundant—it is an inefficient and wasteful use of staff time. Unfortunately, if portable electronic equipment is not available for the data collection, it may be a necessary step in the audit process.

Regardless of the recording mechanism, all data eventually need to be translated into an electronic format so that they can be managed, analyzed, and stored more efficiently. Data should also be recorded in a consistent manner so that comparisons can be made over time (e.g., trending and/or benchmarking).

A picture is worth a thousand words…

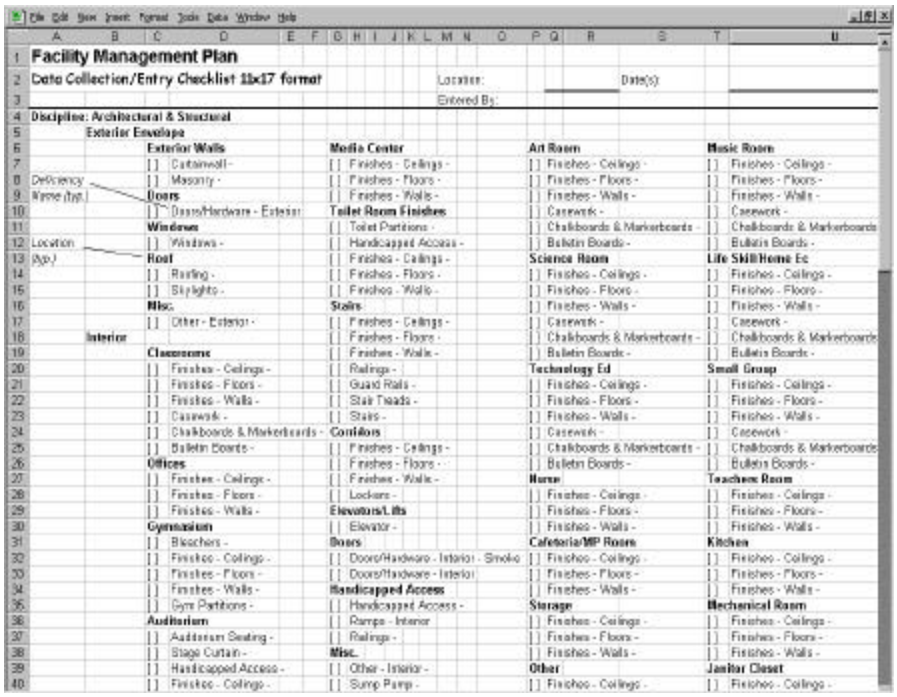
Videotaping sites can serve as a very powerful data collection and documentation tool. Videos can be taken with digital cameras or converted to digital format without much trouble. They can then be used to demonstrate facility conditions—highlighting either improvements already made or deficiencies that must be remedied. They can also serve as evidence of ownership, for example, when filing an insurance report for items lost in a fire.

Once the annual audit is accomplished, facilities staff should review the findings for accuracy. Moreover, every modification, upgrade, and renovation that ensues should be integrated into the audit records. Maintaining these data in an orderly and consistent fashion ensures that planners and repair people alike know the most up-to-date status of the facilities as they make their day-to-day and long-term decisions.

Good Data Collection and Use: A Friend to Students and Administrators Alike

Good data collection and use can be as simple as a log/notation system on a building's floor plan diagram. For example, Cheryl, the school nurse at Homer Elementary, decided to identify every accident incident that was reported in her school building. When she marked off a third slip and fall accident in the same location on her floor plan, she told the principal who initiated a more detailed investigation. It turned out that a newly hired custodian was over-applying buffing oil on his dry mop and leaving an extremely slippery residue on the floor. The custodian was immediately retrained on how to apply the agent correctly, and the training sheet for new staff was updated to discourage similar mistakes. Without the information that the school nurse's data collection had unveiled, there would likely have been more unexplained accidents occurring in the hallways. But with Cheryl's simple (and inexpensive) data collection tool, the school probably avoided additional injuries to students.

Example of a Facilities Audit Spreadsheet



Facility Management Plan

Data Collection/Entry Checklist 11x17 format

Location: Date(s):

Entered By:

Discipline: Architectural & Structural

Exterior Envelope

Exterior Walls	Media Center	Art Room	Music Room
[ ] Curtainwall -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Masonry -	[ ] Finishes - Floors -	[ ] Finishes - Floors -	[ ] Finishes - Floors -
Doors	[ ] Finishes - Walls -	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Doors/Hardware - Exterior	**Toilet Room Finishes**	[ ] Casework -	[ ] Casework -
Windows	[ ] Toilet Partitions -	[ ] Chalkboards & Markerboards -	[ ] Chalkboards & Markerboards
[ ] Windows -	[ ] Handicapped Access -	[ ] Bulletin Boards -	[ ] Bulletin Boards -
Roof	[ ] Finishes - Ceilings -	**Science Room**	**Life Skill/Home Ec**
[ ] Roofing -	[ ] Finishes - Floors -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Skylights -	[ ] Finishes - Walls -	[ ] Finishes - Floors -	[ ] Finishes - Floors -
Misc.	**Stairs**	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Other - Exterior -	[ ] Finishes - Ceilings -	[ ] Casework -	[ ] Casework -
Interior	[ ] Finishes - Floors -	[ ] Chalkboards & Markerboards -	[ ] Chalkboards & Markerboards
Classrooms	[ ] Finishes - Walls -	[ ] Bulletin Boards -	[ ] Bulletin Boards -
[ ] Finishes - Ceilings -	[ ] Railings -	**Technology Ed**	**Small Group**
[ ] Finishes - Floors -	[ ] Guard Rails -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Finishes - Walls -	[ ] Stair Treads -	[ ] Finishes - Floors -	[ ] Finishes - Floors -
[ ] Casework -	[ ] Stairs -	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Chalkboards & Markerboards -	**Corridors**	[ ] Casework -	[ ] Casework -
[ ] Bulletin Boards -	[ ] Finishes - Ceilings -	[ ] Chalkboards & Markerboards -	[ ] Chalkboards & Markerboards
Offices	[ ] Finishes - Floors -	[ ] Bulletin Boards -	[ ] Bulletin Boards -
[ ] Finishes - Ceilings -	[ ] Finishes - Walls -	**Nurse**	**Teachers Room**
[ ] Finishes - Floors -	[ ] Lockers -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Finishes - Walls -	**Elevators/Lifts**	[ ] Finishes - Floors -	[ ] Finishes - Floors -
Gymnasium	[ ] Elevator -	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Bleachers -	**Doors**	**Cafeteria/MP Room**	**Kitchen**
[ ] Finishes - Ceilings -	[ ] Doors/Hardware - Interior - Smoke	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Finishes - Floors -	[ ] Doors/Hardware - Interior	[ ] Finishes - Floors -	[ ] Finishes - Floors -
[ ] Finishes - Walls -	**Handicapped Access**	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Gym Partitions -	[ ] Handicapped Access -	**Storage**	**Mechanical Room**
Auditorium	[ ] Ramps - Interior	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -
[ ] Auditorium Seating -	[ ] Railings -	[ ] Finishes - Floors -	[ ] Finishes - Floors -
[ ] Stage Curtain -	**Misc.**	[ ] Finishes - Walls -	[ ] Finishes - Walls -
[ ] Handicapped Access -	[ ] Other - Interior -	**Other**	**Janitor Closet**
[ ] Finishes - Ceilings -	[ ] Sump Pump -	[ ] Finishes - Ceilings -	[ ] Finishes - Ceilings -

Deficiency Name (typ.)

Location (typ.)

This School Building Facility Management Checklist is included in its entirety in Appendix D.

In a nutshell, features common to all good facilities audit data collection systems include:

- ✓ *The element list contains all buildings, grounds, and equipment at all sites.*
- ✓ *The element list is comprehensive for all sites, buildings, rooms, and spaces.*
- ✓ *The element list reflects both permanent features (e.g., structures) and temporary features (e.g., traffic patterns, snow buildup/problem areas).*
- ✓ *Data collections are element driven and do not, therefore, include fields for long narratives that are difficult to fit into data models (i.e., your data should be able to fit into a spreadsheet type format).*
- ✓ *The data collection is element-by-element based so that records are maintained about each individual component (e.g., each window has a record of its year of installation, brand of replacement parts, service dates and descriptions, precise location, etc.).*
- ✓ *The data are recorded electronically in a format that can be exported into a database or spreadsheet so that they need not be rekeyed at any point after being collected (this saves time, energy, and money, and reduces clerical errors).*
- ✓ *The data are reviewed for accuracy and quality by the facility management and maintenance team. This team prioritizes the findings and modifies the scope of the data collection if there are issues that have not been addressed.*

When Do You Collect the Data?

The best time to initiate a facility audit for the first time is when the district undertakes major construction or renovation activities. However, if major renovations are not scheduled in the foreseeable future, it is important that a facility auditing program be established all the same. Regardless of when auditing is initiated, it must be continued on a regular basis (e.g., annually) because conditions are constantly changing. If facility audits are an ongoing feature of maintenance management, then the previous year's data can guide the following year's audit and make the task a much easier endeavor.

Data Management

Most school facility managers are extremely competent and have served their districts well for many years. They are ingenious problem solvers who can readily apply common sense as needed. However, the roles and responsibilities of the facility manager have changed greatly over recent years—ranging from asbestos management to contract procurement, and high-tech computer operations to refitting a 50-year old coal boiler. Some of these tasks leave little room for error. Thus, it has become necessary for facility managers to be expert collectors, organizers, and assessors of facilities data in order to ensure that a school district is able to provide safe and well-maintained school buildings.

How does your organization collect facilities data? How does it use facilities data? If you can't answer these questions confidently, it is probably time for your organization to adopt a more systematic approach to data management.

But data collection for its own sake is an exercise in futility. Rather, data collections should be motivated by and geared toward providing information for better management of the organization. Which data are collected is often driven by many sources: the boss' monthly report, the school board's quarterly report, the state's annual facilities collection, or regulatory requirements, to name but a few. If these reports are not submitted in a timely manner, someone is going to come looking for them and someone else is going to be in trouble. However, collecting meaningless data and submitting an equally meaningless report is unlikely to be of much value to the planning process. On the other hand, collecting and reporting good data for use in analysis, trending, and planning is a vital step toward good organizational management.

Some data management may be mandated by state and local regulations (e.g., maintenance records on the boiler, amounts and types of fuel used, the operation of emergency generators, and the use of pesticides).

On average, the facility operations budget represents about 10 percent of a school district's entire spending (and that doesn't include additional capital funding for major construction and renovation). Thus, facilities warrant the attention of an organization's top management—who should appreciate that investing resources in facilities data collection and information systems is an integral part of any district-wide management plan. This does not necessarily mean that such systems have to be expensive, although managing facilities data is worth even a substantial investment. In fact, trying to manage a school district without such a system is by far the most expensive solution of all, because other resources (e.g., human, capital, and operational) will undoubtedly be squandered by misguided attempts to cut costs on data management.

Facilities data can be used to describe operational or financial aspects of a system. Even if overall operations are sound, data analysis can identify components that can be improved. Moreover, data can reveal clues to impending problems that no one is even looking for!

Because these data are so valuable, they should be regarded as an organizational asset that must be considered in any risk management planning—in other words, facilities data must be maintained securely. This means that copies should be stored in several safe sites to decrease the likelihood of accidental loss or damage (referred to as distributed storage). Many organizations, including some schools, are now contracting with external organizations to store backup files at remote locations. These facilities can be extremely secure and often offer security "guarantees" to client organizations.

Facilities data are facilities history. They are essential for warranties, insurance claims, operations, and planning.

Similarly, original as-designed and as-built drawings of the organization's facilities are irreplaceable, and should be treated as such. They should be time and date stamped, scanned, archived (redundantly), and loaned only under a strictly enforced chain-of-custody. In other words, the facilities department needs to serve as the custodian of all facilities records or, at least, verify that someone else is handling the job responsibly.

Data exchange and the ability to move data to upgraded software systems are two issues that school districts are increasingly encountering. Thus, it is important to ensure that the facilities maintenance data are stored in a computer database that is robust enough to allow for easy data import and export. At the very least, the data should be stored in an electronic spreadsheet with each column representing a data field (or element) and each row representing a data record (or thing). Popular spreadsheet

software allows for data import and export so that the information can be exchanged without much refitting.

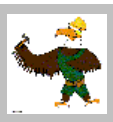
Images stored in standard formats such as TIFF and JPEG are also easily manipulated between systems. In recent years, document imaging software and supporting computer equipment have become more affordable. Thus, many school districts are now investing in document imaging systems in order to reclaim office space taken up by large storage cabinets. These systems scan documents (e.g., blueprints, contracts, manuals, and purchase orders) and store the images on computer hard disks or CDs. The images can be indexed by keywords for fast searching and retrieval. Some document imaging systems even utilize Optical Character Recognition (OCR) to enable image retrieval based on user queries.

CMMS software is a cornerstone of facility management for a district with more than 500,000 ft^2 of building space.

Although many schools and school districts have automated their data collection and record keeping systems, some smaller agencies have not yet had either the need or the resources to do so. However, a Computerized Maintenance Management System (CMMS) becomes necessary when staff are responsible for managing more than about 500,000 square feet of facilities. At that point, facilities, assets, staff, and scheduling become complex enough to warrant an investment in software, equipment, and staff training without raising much doubt as to whether the costs will be recouped. Installing a CMMS requires resources, manpower and, above all, support from management at all levels of the organization. Good CMMS packages should be interoperable with other operating systems and software and integrate a wide range of facilities management components, including facilities (structures and spaces including grounds and equipment), staff, users, work orders, scheduling, and compliance and regulatory issues. More specifically, asset management software should track building components, furniture, and equipment by their age and life cycle, and report preventive maintenance measures necessary for effective resource management.

Risk Management Means Protecting Your Facilities Data

Constructing a data storage and security plan for a school district is a significant task in its own right. The National Forum on Education Statistics provides guidance on this front in a document titled "Safeguarding Your Technology: Practical Guidelines for Electronic Education Information Security" available electronically at no cost at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297.

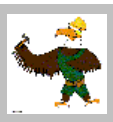


When a Bandaid Can Save You Money… Even in the Long Run!

The school board meeting was about to get ugly. The PTA was as hot as the east wing of the elementary school. They wanted that cooling tower repaired… and repaired properly! Hadn't it broken down last September too? The Board President turned to the Superintendent to get some answers. The Superintendent, in turn, looked to Ted, the new School Facilities Manager. Ted began to explain, "Well, we patched several rust spots last summer, but the tower is really on its last legs…" He was interrupted by the PTA President, "but we're sick of this bandaid approach to maintenance." It was a reasonable comment, Ted knew, but if he was at all uncertain about the role of "bandaids" in the district, the position was confirmed by the Board President's indignant reply. "Ted, we were very clear about our expectations for the repair of capital equipment before you were hired. We will not tolerate a bandaid approach to maintenance in this school district. It is simply a waste of taxpayer money and unfair to the parents and students in the community. Is that understood?" It was, and Ted said so, but at the same time he pulled a report out of his briefcase, "Yes sir, a bandaid approach is a waste of money 99% of the time, but the cooling tower in question is an exception… you see, it's 19 years old," he began, pointing at an entry on a spreadsheet he had handed the Board President, "and only has a 20 year expected service lifetime. So it doesn't make sense to invest in a complete overhaul when the school will be getting a brand new piece of equipment next year. It's simply not a good use of our maintenance budget." The Board President looked at Ted and realized he was right. He had the data in his hand that said so.

Data Use

Facilities data are not only useful, but also necessary, for responsible facilities management—which is the only possible reason for justifying data collection and storage costs for most people. In a most general sense, data from facility audits assist decision-making with respect to repair, renovation, or abandonment. However, some facilities data must be readily accessible in the case of emergency (e.g., building blueprints are important when fighting a fire). Other data are necessary for long-term planning (e.g., expiration dates on roof warranties). Finally, some information is needed on a day-to-day basis (e.g., fuel requirements and load capacities on a fleet of buses). In all cases, access to facilities data in a timely manner is a requirement for effective school management.



Facilities Data Access as a Component of Emergency Preparedness

The school district had done everything in its power to secure its school sites appropriately, but sometimes even the most well-considered plan can't deter trouble completely. So when a call was received in the maintenance office from the chief of police, Jerry wasn't taken aback… he'd always known that the possibility of real trouble existed even in his small community. Eileen, his assistant, was amazed at how calm Jerry stayed throughout the short and focused conversation. "Yes sir," Jerry said, "I'll email the building's blueprints immediately." He looked at his watch. "And I can have a paper copy to you in fifteen minutes." As he hung up the phone, he turned quickly to Eileen. "There is an emergency at the high school and the police chief needs information about the egresses. Print out a copy of the blueprints as fast as you can while I email him an electronic copy." Within three minutes of receiving the call, Jerry was speeding toward the high school with a paper copy of the blue prints in hand and an electronic copy already on the chief's laptop computer. The rest of the day's events would be out of his control, but Jerry's planning had ensured that the maintenance office had done everything it could do to help.

For more information about facilities data collections and audits, visit the following Web pages: Basic Data Elements For Elementary and Secondary Education Information Systems at http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=97531; Facilities Information Management: A Guide for State and Local Education Agencies at http://nces.ed.gov/forum/publications.asp; Facilities Assessment at http://www.edfacilities.org/rl/facility_assessment.cfm; and Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations at http://www.peci.org/om/assess.pdf.

Commissioning: A Special Type of Facilities Audit

Even the best trained auditors are unlikely to know whether systems are operating as designed and intended just by looking at them (because "systems" can not be evaluated as simply as components can). Thus, facilities must be commissioned, recommissioned, and/or retro-commissioned.

"Commissioning" is a specific type of facilities audit intended to verify (and document) that a facility will operate as designed and meet the demands of its intended use. Commissioning focuses not on individual elements in a building, but rather on system performance within a facility. A third party (beholden to neither the organization that paid for the building nor the contractor who constructed it) generally carries out commissioning *before* site responsibility transfers from the contractor to the school district. Commissioning often occurs upon completion of a construction or renovation project, however, pre-commissioning can occur as early as the design phase, at which time impartial experts can review blueprints for adherence to building codes, HVAC requirements, and other performance criteria.

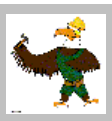
Commissioning focuses not on individual building elements, but rather on system performance within a facility. It is tantamount to a "stress test" in which major building components are systematically tested to ensure that they meet required specifications.

It is imperative that the commissioning process be included in all construction and renovation contracts as a standard requirement prior to the transfer of liability from the contractor to the school district. Although initial commissioning can occur as early as the design phase of a project, and more likely upon the completion of construction activities, additional tests should be required throughout the course of one calendar year so that components can be examined during the range of seasonal conditions (e.g., hot and cold or wet and dry). When formulating the details of a commissioning effort, district representatives should be certain to identify: (1) all systems being studied/controlled; (2)

the design logic that supports the approach; (3) applicable industry standards; and (4) the acceptable range of system output (which varies with seasonal conditions).

According to… Energy Smart Schools (http://www.eren.doe.gov/energysmartschools/om_implement.html), major steps in the commissioning process include:

- ✓ *Be clear about expected outcomes, such as how the building should perform, what the occupants need, and how much it costs.*
- ✓ *Test building systems and equipment to make sure that they work correctly and meet design and operational specifications.*
- ✓ *Measure and/or predict the basic energy efficiency and thermal/environmental performance of the building's important energy systems (e.g., automatic heating, air conditioning, refrigeration, lighting).*
- ✓ *Decide whether upgrades and modifications to the as-built facility are necessary to meet the requested needs of school leaders, teachers, and students.*
- ✓ *Verify that building and system operators have received appropriate training.*
- ✓ *Provide building system documentation for future operations and maintenance so that the school will continue to perform reliably and reap expected savings.*



Commissioning Has Its Rewards!

The accountant overseeing the school renovation project had been against commissioning from the start. "Even if it does cost less than one percent of the project, that's more money than I'd like to spend… I mean for that price, we could upgrade the landscape in front of the building," he had argued to Carl, the maintenance manager who had insisted on the commissioning. Carl always had the same reply, "I know Howard, but the commissioning will pay for itself, just wait and see. Don't you know that fifteen percent of all completed buildings are missing components that they have paid for?" In the end, Carl got his way and the third-party commissioning was performed by a local general contractor. When Carl got the results, he walked straight into Howard's office and personally placed them in the accountant's hands. "See, Howard. I told you commissioning would pay for itself. It uncovered over $3,000 worth of equipment that we paid for but is still missing." Howard looked at the report. "Yes, Carl," he paused to study the findings a bit longer, "but do you see that the report shows that the current configuration of the HVAC system is not fully efficient?" Carl interjected, "But it's good that we find that out now, Howard." Howard interrupted him, "That's not good, Carl. It's fantastic. Why, that alone will save us the cost of that commissioning in just two years once we get the system tuned up. You know, Carl, this commissioning report doesn't just save us money now, it saves us money in the future when we're running the building too." Carl rolled his eyes, knowing that he had been right all along, but pleased that Howard had finally seen his point, "Is that so, Howard?"

Recommissioning is the act of commissioning "again". It should occur any time a building is renovated or substantially modified (e.g., a classroom is changed into a computer lab) or, in the absence of renovation and modification, on a 5-year cycle just to ensure that systems are performing appropriately over time. Recommissioning involves revisiting systems in order to retest them relative, at least in part, to baselines established during the original commissioning event. By adopting this approach to facility auditing, the status of the system can be measured and assessed relative to its "as-new" condition.

Finally, retro-commissioning is performed on *existing* buildings that have never before been commissioned. Although the district is unlikely to be able to hold contractors responsible for failing systems identified during retro-commissioning (because the systems have presumably been out of the contractor's control for some period of time), baselines can be established and deficiencies identified all the same. This is especially valuable information to have for facilities that have been upgraded or otherwise modified since original construction.

Norman knows commissioning, and you should too!

During the school year, the superintendent asked the facility director, Norman, to change some of the classrooms in the Middle School into computer rooms. Because Norman was a competent director, he realized that the additional energy draw and heat output of the computers in the reorganized space would add to the HVAC load and cause the overall performance of the building's HVAC system to change dramatically. In order to find out how dramatic the change would be, Norman knew that he would need to measure the performance of the HVAC system. Luckily, Norman had a baseline for comparison because the Middle School had been commissioned when building construction had originally been completed three years earlier (i.e., an expert had verified that the building's systems were working according to their original design). However, once Norman changed the configuration and use of rooms, and the demands on the HVAC, electrical, and technological systems, he could no longer feel confident that the results of this original commissioning were still valid. So after the building modifications had been completed, he would need to have the systems recommissioned in order to verify that they were still working as intended (and fix them if they were not). Norman knew that recommissioning was rarely conducted, but that it was extremely important to efficient building operation all the same. After all, when room design and use is modified, system operations are changed—and comfort levels, indoor air quality, and utility bills can all change as well. Recommissioning costs money, but not nearly as much as inefficient and ineffective building systems over time. Luckily for the school district, Norman was on their team and knew to campaign for the recommissioning as the final step in the superintendent's plan to modify the Middle School.

For more information about commissioning, visit the following Web pages: Building Commissioning at http://www.edfacilities.org/rl/commissioning.cfm; Building Commissioning Association at http://www.bcxa.org; Portland Energy Conservation, Inc. (PECI) at http://www.peci.org/; and Practical Guide for Commissioning Existing Buildings at http://www.ornl.gov/~webworks/cppr/y2001/rpt/101847.pdf.

The Importance of Benchmarking

If long-term planning (including both policy and financial initiatives) is to be effective, it must be based on accurate information about the condition of the facilities. This includes an accurate portrayal of both the physical condition of facilities and their ability to meet functional requirements of the instructional program. One way of determining functional ability is through the use of benchmarks. Benchmarking is the act of charting and comparing activities, standards, levels of performance, and other factors against a facility's history, similar facilities (i.e., its peers), or independent building usage data (as can be found in trade publications).

Commonly Asked Questions

Why is a facility audit considered to be a data collection? A facility audit is an element-by-element assessment of an organization's buildings, grounds, and equipment. Thus, auditing generates large amounts of descriptive data (e.g., what it is, where it is, how old it is, its condition, its maintenance needs, etc.). These data must be presented in a way that allows them to be used as information. If the findings of a facilities audit are not managed properly, they will quickly become disorganized and will not meet the information needs of potential users. Thus, facility audits must be treated as data collections and managed as such.

How can facilities data inform decision-making? Facilities data can, and should, inform both short- and long-term policy making decisions. Moreover, the data also help with day-to-day operations and decision-making. For example, say a high school's ice machine breaks down and the estimate to repair it is 1/3rd of the replacement cost for the machine. Do you spend the money on the repair or apply it to the price of replacing the machine? The answer, of course, depends on whether the machine is 12 years old (and therefore near the end of its expected life and likely to break again) or 4 years old (and presumably less likely to break again). Clearly, having access to facilities data can influence this type of routine facilities management decision.

What information needs to be collected during a facility audit? Data should be collected on all buildings, grounds, and equipment within all sites, buildings, rooms, and spaces. It should include both permanent features (e.g., structures) and temporary features (e.g., traffic patterns and snow buildup/problem areas). In a general sense, each element should be described by: What? Where? Size? Number? How old? What Condition? Working as purchased/designed? Working as it should be? Working as it needs to be to meet the needs of the users? Repair history? Sizes and specifications (e.g., oil type and filter sizes)? Evidence of future needs? Recommended service? *and* Estimated remaining useful life?

Facility Audit Checklist

More information about accomplishing checklist points can be found in the text on the page listed in the right hand column.

Accomplished		Check Points	Page
Yes ✓	No ✕		
		Have district planners scheduled a facility audit?	41
		Has a chief auditor been selected (based on expertise, perspective, experience, and availability)?	43
		Has a qualified auditing *team* been assembled?	44
		Have key district administrators shared with the auditing team their vision for future facility use?	44
		Has the scope of work been identified for the audit (i.e., how detailed and comprehensive should the audit be)?	44
		Has a data collection system (e.g., collection forms) been selected for the facilities audit?	47
		Has an automated data input system been selected as resources allow?	47
		Have audit findings been submitted in an electronic format that can be manipulated by district users?	47
		Have audit findings been reviewed by facilities managers for accuracy and quality?	47
		Are the findings from the facilities audit being stored securely (e.g., redundantly) as valuable organizational assets?	50
		Has an automated document imaging system been implemented as resources allow?	51
		Has a Computerized Maintenance Management System been installed in any district that has more than 500,000 ft^2 of facilities to manage?	51
		Are facilities data being used to inform policy-making, short- and long-term planning, and day-to-day operations as appropriate?	52
		Have facilities been commissioned, recommissioned, or retro-commissioned as necessary?	53
		Have commissioning, recommissioning, and retro-commissioning been planned to include seasonal analysis of systems?	53
		Have commissioning, recommissioning, and retro-commissioning been planned according to the Energy Smart Schools recommendations?	54
		Have facilities audit findings been used to establish benchmarks for measuring equipment life and maintenance progress?	56

Additional Resources

Every effort has been made to verify the accuracy of all URLs listed in this guide at the time of publication. If, however, a URL is no longer working, please use the root directory to search for a page that may have moved since the release of this guide. E.g., if the link to http://www.epa.gov/iaq/schools/performance.html is not working, try http://www.epa.gov/ and search for "IAQ".

Basic Data Elements For Elementary and Secondary Education Information Systems
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=97531
This document contains a set of basic student and staff data elements that serve as common language for promoting the collection and reporting of comparable education data to guide policy and assist in the administration of state and local education systems. The document is available electronically at no cost. Core Data Task Force of the National Forum on Education Statistics (1997) National Center for Education Statistics, Washington, DC.

Building Commissioning
http://www.edfacilities.org/rl/commissioning.cfm
A list of links, books, and journal articles about building commissioning. National Clearinghouse for Educational Facilities, Washington, DC.

Building Commissioning Association
http://www.bcxa.org
A professional association dedicated to the promotion of high standards for building commissioning practices.

Building Commissioning Handbook
http://www.appa.org/resources/publications
This book focuses on building commissioning, including the roles of the consultant, contractor, test engineer, commissioning agent, and owner and the process of equipment testing and systems performance testing. It also includes a description of commissioning terms, testing checklists, and guidance with regard to hiring a commissioning agent. Heinz, J.A. and Casault, R. (1996) The Association of Higher Education Facilities Officers, Alexandria, VA, 311p.

Building Evaluation Techniques
Step-by-step techniques for conducting an effective building assessment, including the evaluation of overall structural performance, spatial comfort, noise control, air quality, and energy consumption. Features sample forms and checklists tailored to specific building types. George Baird, et al. (1995) McGraw Hill, 207p.

Energy Smart Schools
http://www.eren.doe.gov/energysmartschools/
An initiative by the U.S. Department of Energy to provide detailed information about how to increase school building energy efficiency and improve the learning environment. It includes a special section on school facility commissioning.

Facilities Audit: A Process for Improving Facilities Conditions,
This handbook presents a step-by-step approach to all phases of a facility inspection. It helps the facility manager assess the functional performance of school buildings and infrastructure and provides information about how to quantify maintenance deficiencies, summarize inspection results, and present the audit findings for capital renewal funding. Kaiser, Harvey (1993) APPA, The Association of Higher Education Facilities Officers, Washington, DC, 102p.

Facilities Assessment
http://www.edfacilities.org/rl/facility_assessment.cfm

A list of links, books, and journal articles about methods for assessing school buildings and building elements for planning and management purposes. National Clearinghouse for Educational Facilities, Washington, DC.

Facilities Evaluation Handbook: Safety, Fire Protection, and Environmental Compliance, 2nd Edition
A guide to help plant and facilities managers conduct inspections and evaluations of their facilities in order to pinpoint and solve problems in the areas of maintenance, safety, energy efficiency, and environmental compliance. Petrocelly, K. L. and Thumann, Albert (1999) Fairmont Press, Lilburn, GA, 200p.

Facilities Information Management: A Guide for State and Local Education Agencies
http://nces.ed.gov/forum/publications.asp
A publication from the National Forum on Education Statistics that defines a set of data elements that are critical to answering overarching policy questions related to elementary and secondary school facility management. The document is available electronically at no cost. Facilities Maintenance Task Force, National Forum on Education Statistics (2003) National Center for Education Statistics, Washington, DC.

Guide for School Facility Appraisal
This guide provides a comprehensive method for measuring the quality and educational effectiveness of school facilities. It can be used to perform a post-occupancy review, formulate a formal record, highlight specific appraisal needs, examine the need for new facilities or renovations, or serve as an instructional tool. Hawkins, Harold L. and Lilley, H. Edward (1998) Council for Educational Facility Planners International, Scottsdale, AZ, 52p.

Operation and Maintenance Assessments: A Best Practice for Energy-Efficient Building Operations
http://www.peci.org/om/assess.pdf
This publication describes what an operations and maintenance assessment is, who should perform it, the benefits of an assessment, what it costs, and the process of performing an assessment. It includes a glossary of terms, sample site-assessment forms, a request for proposal checklist, sample procedures and plan, and a sample master log of findings. (1999) Portland Energy Conservation, Inc. Portland, OR, 54p.

Portland Energy Conservation, Inc. (PECI)
http://www.peci.org/
PECI disseminates information about commissioning conferences, case studies, procedural guidelines, specifications, functional tests, and the model commission plan and guide specifications.

Practical Guide for Commissioning Existing Buildings
http://www.ornl.gov/~webworks/cppr/y2001/rpt/101847.pdf
This document describes commissioning terminology, the costs and benefits of commissioning, retro-commissioning, the steps to effective commissioning, and the roles of various team members in the commissioning process. Haasl, T. and Sharp, T. (1999) U.S. Department of Energy, Washington, DC.

Safeguarding Your Technology
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297
These guidelines have been prepared by the National Forum on Education Statistics to help educational administrators and staff at the building, campus, district, and state levels better understand why and how to effectively secure an organization's sensitive information, critical systems, computer equipment, and network access. The document is available electronically at no cost. Technology Security Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

Chapter 4

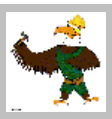
Providing a Safe Environment for Learning

Maintenance efforts must, first and foremost, ensure safe building conditions—in other words, safety is the priority over cleanliness, orderliness, cost-effectiveness, and even instructional support.

Table of Contents:

Goals:

- ✓ ***To identify numerous environmental- and safety-related topics that demand an education organization's undivided attention.***



Would You Want To Drink The Water?

The water inspection team showed up at 7:00 a.m. and proceeded to go about its business before the school day started so as to not disrupt any students. Samples from the first fountain showed lead levels just below the maximum allowed by the EPA. Phil, the chief inspector, knew that to be unusual in the well-managed school district—but he rationalized that it was, after all, one of the older buildings in the system. But when the second and third fountains had lead levels above the legal standards, Phil knew he had a problem. He went straight to the principal's office. "Mr. Jackson, we need to talk." "Why Phil, what are you doing here? Come to repair the faculty restroom?" Mr. Jackson asked lightheartedly. But when Phil explained the situation, Mr. Jackson shook his head incredulously, "Phil, that can't be true. Rick Jones had a water inspection team in here just yesterday afternoon and everything was fine." He showed Phil the paper work to prove it. "Well," Phil replied, "first we're going to have to revise our work order system, because you shouldn't have been inspected twice in the same week—but even so, I can't disregard the results of these tests we just did." "No you can't," Mr. Jackson agreed, "but you can retest them just to make sure." Phil nodded, and went back to the fountains with Mr. Jackson looking over his shoulder all the way. Phil broke open a new test kit… and got the same results. Mr. Jackson looked perplexed, but didn't want to put his students at risk. "Okay, Phil, we'll shut down the bad fountains until we can figure out what's going on." After several days of additional testing, Phil determined that the drinking water met EPA requirements when the water had been allowed to run for a while (throughout the morning, for example), but exceeded the standards until the system had been flushed out each day. This meant that the children were drinking bad water for a few hours each morning—and that just wasn't acceptable. Phil and Mr. Jackson agreed that the building's fountains needed new pipes. After all, it was their legal and ethical responsibility to make sure that the students weren't drinking contaminated water.

Ensuring Environmental Safety

Facilities maintenance is concerned first and foremost about ensuring safe conditions for facility users—be they students, teachers, staff, parents, or guests to district property. As important as cleanliness, orderliness, and instructional support may be to the objectives of facilities planners, occupant safety must always be the overarching priority. Thus, while it may be difficult to gain consensus on what, precisely, constitutes a "safe" environment, it is fair to say that ensuring safe conditions is a major component of effective school facility management.

The facility manager's role in ensuring building safety has changed in recent years. One of the facility manager's chief responsibilities has now become supervising the implementation of numerous environmental regulations governing school facilities and grounds. Moreover, the facilities manager must also verify compliance with a host of regulations and laws as well. Thus, the successful management of a school facility environment has grown well beyond the capabilities of just a single person.

The primary responsibility of school facility planners is to ensure environmental safety in school facilities.

Environmental regulations are many and varied. While they may seem overwhelming to the uninformed reader, most environmental safety regulations have been conceived and mandated for the express purpose of protecting people and/or their environment. Moreover, many regulations require minimal effort with regard to monitoring, avoidance, and detection unless or until a problem arises.

The first step in complying with environmental regulations is to become aware of their existence, intent, applicability, and requirements. In most cases, this knowledge can come from regulatory agencies, professional associations, and on-the-job training. Getting this information may not always be expensive, but it does demand considerable expertise, either hired or developed. In all cases, however, this investment pays off relative to the alternative—the possible occurrence of major indoor air problems, underground storage tank leaks, contaminated drinking water, or other serious environmental and health incidents.

Major catastrophes and other serious incidents are not the preferred method of learning about environmental regulations. It is better for a school district to be proactive in its learning and find out about environmental regulations from regulatory agencies, state departments of education, and professional associations.

The "Four Horsemen" of School Facilities Maintenance:
Indoor Air Quality, Asbestos, Water Management, and Waste Management

Indoor Air Quality (IAQ)

IAQ is a term that encompasses almost anything and everything that affects the air in a building or facility, including to some degree radon gas, paint odors, mold, construction dust, asbestos, and stack emissions. It also covers issues such as allergies, personal hygiene, perfumes and hair sprays. As allergies and "irritants" proliferate, district maintenance staff must make themselves knowledgeable about the issues, as must students and parents. One of the best resources available for IAQ work is the "Tools for Schools" action kit developed by the U.S. Environmental Protection Agency (http://www.epa.gov/iaq/schools/). It contains simple and straightforward investigative checklists and hints for problem solving. It also provides additional resources for guiding work in this highly sensitive area.

Poor indoor air quality can affect student and teacher performance by causing eye, nose, and throat irritation, fatigue, headache, nausea, sinus problems, and other minor or serious illnesses. Thus, reasonable steps must be taken to ensure that IAQ causes neither actual nor perceived illness in facility occupants. Reasonable actions might include the following recommendations, although official standards may vary from state to state and locality to locality:

- ✓ Ventilate occupied areas at a minimum rate of 15 cubic feet per minute (cfm).
- ✓ Maintain indoor CO_2 between 800 and 1000 parts per million (ppm).
- ✓ Install both fresh air supply *and* exhaust ventilation systems in occupied areas.
- ✓ Avoid recirculating previously exhausted contaminants when ventilating.
- ✓ Ensure adequate make up air in boilers in order to minimize backfires and carbon monoxide contamination.
- ✓ Maintain indoor air relative humidity below 70%.
- ✓ Maintain indoor air temperature at comfortable levels (e.g., 68-72°F when the room is being heated and 70-78°F when the room is being cooled).
- ✓ Inspect for water damage and eliminate standing water and elevated humidity.
- ✓ Clean and dry water damaged materials within 72 hours of wetting or remove them.
- ✓ Change filters and cleaning drip pans according to manufacturer's instructions, noting that filters in high pollution areas may require more frequent service.
- ✓ Seal construction/renovation from occupied areas to minimize air exchange.

- ✓ Minimize volatile chemical use (e.g., in cleaning agents and pesticides), especially while the building is occupied.
- ✓ Replace toxic and noxious chemicals with less harmful products as available.
- ✓ Store toxic and noxious supplies in areas with adequate exhaust systems.
- ✓ Situate vehicle idling areas away from occupied buildings and ventilation inlets.
- ✓ Dispose of used cleaning supplies and water-damaged materials immediately and properly (i.e., double bagged in 6-mil polyethylene plastic).
- ✓ Balance all HVAC, air handling, and ventilation systems every five years.
- ✓ Periodically test air samples for CO_2 (a sign of poor ventilation), CO (a sign of incomplete combustion), relative humidity (a sign of leaks and moisture problems), and air temperature.
- ✓ Sample for microbial (e.g., mold) growth when an IAQ problem is suspected.

Most districts that find themselves in trouble with IAQ issues get into the predicament because they have failed to observe or respond to the signs of a growing problem. Many IAQ issues may not be preventable, but can be "fixed" when monitoring, well-trained staff, and adequate resources allow for the problem to be identified and addressed in a timely manner.

Schools that ignore IAQ signals have a much greater chance of finding their problems described in the local newspaper.

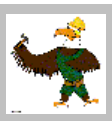
Indoor air always starts as one thing—outdoor air. Unfortunately, outdoor air is sometimes itself poor in quality. Today's requirements for fresh air exchange in schools mean that whatever impurities occur in the outdoor air will be brought into the indoor air. In other words, someone susceptible to hay fever may be able to find relief in their tightly sealed home, but they won't find it in a school classroom.

Indoor air quality actually begins with outside air!

Good IAQ plans strive for problem solving through systematic investigation and, when all else fails, professional help. District staff must be encouraged to investigate all complaints in a thorough and timely manner. Ongoing complaints may indicate larger and/or growing problems. Individual complaints can indicate a single problem in a secluded area or it can be the first clue of a major failure. While the details of IAQ work can be both "scientific" and difficult to understand, they are more frequently straightforward and common sense. Not surprisingly, IAQ investigations oftentimes point to expected sources, such as the classroom pet (e.g., the 4th grade's hamster) or sprays and perfumes worn by students and staff. Reactions to certain foods and food supplements also arise. Some people are allergic to the aloe embedded in tissues and

hand soaps. Investigators must keep in mind that the parents of young children (i.e., at the elementary level) may not yet have had an opportunity to identify their children's allergies, and therefore cannot warn school staff about potential problems.

If there is reason to suspect biological contamination (e.g., molds and microbes), the lab testing portion of an IAQ investigation begins with a study of the molds, bioaerosols, and other "natural contaminants" in the outside air for use as a control against which indoor air can be compared. Usually, HVAC filtration purifies the outdoor air so that indoor air reflects what is outside with lower quantities of the same impurities. When indoor air tests reveal species of impurities that do not exist in the outdoor control, it suggests that something is "growing" inside. The precise nature of those species will determine whether further investigation is required. Similarly, if investigators suspect that the problem is chemical in nature (e.g., fumes from cleaning agents stored within a facility), then a volatile organic sampling may be undertaken.



IAQ – Sometimes a Mystery for the Even the Best of Detectives

Terry, the facilities director, and his staff had done everything they could think of to solve an IAQ complaint from a student's parent, but it had been to no avail. Finally, they hired a consulting company to focus its considerable expertise on the problem. The HVAC system was investigated from its intake vents, through the ductwork, and into the classroom—and all proved to be in good working order. Indoor air speciation lab tests revealed no concerns and outdoor air control samples were all within proper tolerances. They checked (and re-checked) building sources, housekeeping sources, air temperature, and humidity. The roof was inspected for leaks and mold, but nothing could be found. As if Terry didn't have enough to deal with, the child's parents notified every authority they could find, and now the local media were inquiring about the story. The student's doctor had verified that the child was, indeed, reacting to something in his school that was making him ill. In fact, when the student transferred to another school, all symptoms immediately cleared up—hardening Terry's suspicion that the problem was real. Finally, after weeks of work, one of Terry's staff members saw a teacher's aide spraying an insecticide ("but only lightly") in the student's former classroom because she had seen ants in the snack area. The student was subsequently diagnosed as being hypersensitive to pesticide. So, it all made sense after all, but only after an extensive and expensive investigation. On the bright side, Terry was able to have the classroom cleaned (and the teaching staff trained) so that the student could return to his class.

Common indoor air pollutants include (but are not limited to):

- Tobacco smoke
- Formaldehyde
- Volatile Organic Compounds (VOCs)
- Nitrogen Oxides
- Carbon monoxide
- Carbon dioxide
- Allergens
- Pathogens
- Radon
- Dust
- Lead
- Pesticide use in and around buildings

While this list is far from exhaustive, it probably sounds intimidating all the same because each of these contaminants needs to be understood and managed. After all, many of the compounds can be identified in typical outdoor air pollutants, and all can be routinely linked to buildings and air handling equipment.

Most IAQ problems are a result of inadequate air handling and ventilation. Low levels of contaminants will rarely accumulate to dangerous levels if the air is properly ventilated.

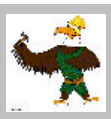
Potential sources of IAQ contaminants include (but are not limited to):

- "fresh" air
- lab and work shop emissions
- insects and pests
- furnaces and fuel lines
- underground sources (e.g., sewer lines and radon gas)
- odors from dumpsters
- cleaning process emissions
- insecticides and pesticides
- building occupants (e.g., perfumes)
- HVAC equipment (which is often a path of distribution)

Building administrators also need to be concerned about *creating* air quality conflicts. For example, landscaping "environmental" areas can be popular and worthwhile school revitalization projects. However, if not properly coordinated with overall facility management efforts, these initiatives can introduce moisture and mold problems (e.g., from mulch outside of air intake vents), lead to fire exit violations (e.g., if they obstruct or impede access to an egress), and invite stinging and biting insect hazards (e.g., attracted by flowering plants that release pollen). *The reasonable response to landscape initiatives is not to forbid them, but to make sure that all projects are carried out with proper foresight.* The right questions must be asked (and answered) prior to granting permission. Issues to be addressed include plot location, intended use, and potential impact on health and safety issues.

Mold, Mildew, and Moisture

While there are numerous IAQ sources in need of attention, the issue of mold is especially prominent. Mold spores occur almost everywhere in the air that we breathe, and almost any building surface can support and nourish mold growth. However, the key factor in enabling mold to grow and reproduce (yes, mold is a living organism) is the presence of moisture. Water intrusions (i.e., leaks) and excessive moisture from other sources can lead to mold problems. Thus, moisture control is the primary mechanism for reducing mold growth. At the same time, a room's humidity level is an important factor in determining occupant comfort. Humidifiers placed in rooms or brought in by staff may provide some benefit to occupants in the immediate vicinity; however, they may also serve as a source of moisture for the rest of the building and have a net effect that is harmful.



Communicating Not Just What, But Why…Creating Moisture at Dew Point

Mary Jane, the principal of Big River Elementary School, was in her second year in the newly built, fully air-conditioned, building. The previous summer, she had had to deal with mold growth in a few areas of the building during the humid days of August, and she was determined to avoid the problem this year.

As a good administrator, Mary Jane had reported the incident to the maintenance department, and an investigation was initiated while the mold was being removed from the building. The investigation revealed that three HVAC units were not operating as designed in the air-conditioning mode. Not surprisingly, the mold had grown in two of the rooms those units had served. The HVAC systems were repaired and double-checked at the end of the school year. However, John, the head of maintenance, felt that more preventive work was warranted, as he suspected that the rooms' thermostats were being set so low as to create "cold spots" that were reaching dew point. So John left a voice mail message with Mary Jane and the building's head custodian to make sure all the thermostat controls were set at 75 to 78 degrees and no lower during the summer break. Unfortunately, John's message didn't explain why he felt so strongly about keeping the temperature from getting too cool. So when the first big heat wave hit in late June, Mary Jane told Pete, the head custodian, to set all the thermostats back down, "We've got people who need to work in this building and I don't want them being this uncomfortable". The custodian reminded her of John's instructions to keep the thermostats set between 75 and 78 degrees, to which Mary responded, "that must have been a different issue—probably related to energy conservation, and although I'm all for that, these people can't work in this heat."

So after a few weeks of end-of-the-year clean up, the school was locked for the rest of the summer with the thermostats set at 65 degrees. By the first week of August, several of teachers arrived to begin preparations for the next academic year. They immediately found Mary Jane to report mold growth in their rooms. Upon further inspection, Mary Jane found mold throughout the building. John was called at the maintenance office and immediately recognized that the problem was beyond the expertise of his staff, so he notified the superintendent that a major cleanup and air testing project would have to be initiated. But as John pursued his investigation, he noted how cool many of the rooms were. He confronted Mary Jane about the thermostat settings. "Didn't I ask you to keep the thermostats set at 75 or above?" "Well yes," Mary Jane said, "but it was so hot in June." "But Mary Jane," John explained, "Our HVAC equipment is sized for building occupancy—that means that it cools a room based on an assumption that 24 children and a teacher will also be in that room giving off body heat. So when a classroom thermostat is set at 65 degrees without occupants, the room temperature reaches the thermostat setting so quickly that it doesn't have time to dehumidify the air, which means that water vapor will condense out in the cool spots, which might reach 60 degrees along the floor and metal surfaces. And once there is standing water, mold is sure to follow."

Both Pete and Mary Jane wished that John had explained this to them before. As it was, it was going take $25,000 to test and clean-up the rooms and HVAC equipment before they could reopen school.

For more information about indoor air quality management, visit the National Clearinghouse for Educational Facilities' IAQ resource list at http://www.edfacilities.org/rl/iaq.cfm, which provides list of links, books, and journal articles addressing indoor air quality issues in K-12 school buildings, including building materials, maintenance practices, renovation procedures and ventilation systems.

Asbestos

Asbestos is a naturally occurring mineral found in certain types of rock formations. When mined and processed, the material takes form as small fibers that are most often invisible to the naked eye. These fibers can then be mixed with a binding material for use in a variety of products. Asbestos products were useful because they are strong, burn resistant, corrosion resistant, and good insulators. In schools, asbestos was most commonly used in building materials. It has been found in floor and ceiling

tile, cement pipe, pipe and boiler insulation, and spray-applied fireproofing. The presence of asbestos-containing materials in a setting does not automatically pose an immediate health threat. However, asbestos does become hazardous when the small fibers are released into the air, as can occur as a result of damage or deterioration.

The type and amount of asbestos in a particular product varies depending upon application. The condition, location, and exposure of the material plays a major role in determining response and planning activities. Because the fibers are so small and light, they can remain airborne for many hours (increasing the chance for inhalation) upon release into the air (i.e., after disturbance or improper care). *This release of asbestos fibers into the air is the primary concern that a school district must strive to prevent.*

Why is it so important that all occurrences of asbestos be identified in school facilities? Because this information guides day-to-day maintenance and operations. For example, if there is asbestos in a building's floor tiles, staff must know not to use the buffer/sander to clean the area or else hazardous fibers could be released into the air.

In 1986, the Asbestos Hazard Emergency Response Act (AHERA) was signed into federal law in order to regulate the management of asbestos-containing materials in all public and private schools. AHERA applies only to interior building materials and those under covered walkways, patios, and porticos.

AHERA requires local education agencies to:

- ✓ Designate and train an asbestos coordinator.
- ✓ Identify friable (i.e., easily crumbled or ground) and non-friable asbestos containing materials.
- ✓ Develop and implement an asbestos management plan.
- ✓ Develop and implement a responsible operations and maintenance program.
- ✓ Perform semiannual surveillance activities.
- ✓ Notify all occupants (and occupant guardians) about the status of asbestos-containing materials on an annual basis.

Asbestos abatement projects (i.e., removal or encapsulation) are most frequently undertaken by outside contractors. District staff who get involved in asbestos removal must be trained, certified and, in some instances, have health records maintained and monitored.

In other words, districts must know where asbestos materials are located in their buildings, inform occupants, and train staff for work in affected areas. Provisions of this law also require districts to conduct inspections for asbestos-containing materials every three years, develop management plans, and

Is your organization following the law…

1) ***Is it conducting its 3 year inspections?***
2) ***How about its semi-annual surveillance?***

implement response actions in a timely fashion. They are further required to update and maintain management plans to reflect ongoing surveillance, inspection, re-inspection, and response action activities. Staff training and certification requirements are required by AHERA. Moreover, EPA officials conduct random checks and audit district records for asbestos monitoring and reporting.

For more information about asbestos and asbestos management, visit the National Clearinghouse for Educational Facilities' Asbestos resource list at ***http://www.edfacilities.org/rl/asbestos.cfm****, which provides lists of links, books, and journal articles on how asbestos abatement and management is conducted in school buildings, and how schools can comply with federal regulations.*

Water Management

Public water supplies are usually divided into two general categories. The first is the "community water system" that serves year-round residents; the second is a "non-community water system" that serves the transient public. If a school district gets its water from a local city authority, it is likely that it is on a "community water system". If, on the other hand, a school district uses its own wells as sources of water, it would be classified as a "non-community system". In 1976, the U.S. Congress passed the Safe Water Drinking Act and authorized the U.S. Environmental Protection Agency to set standards for maximum contaminant levels (MCLs) for specified substances. Moreover, state departments of environmental protection have their own regulations addressing water testing and procedures. In order to ensure compliance with applicable regulations, school districts should:

- ✓ Review pertinent federal, state, and local regulations.
- ✓ Develop a sampling, monitoring, and reporting plan that is commensurate with applicable regulatory guidance.
- ✓ Verify sampling methods used for testing and monitoring.
- ✓ Address all water quality and systems operation deficiencies identified by the compliance plan.
- ✓ Incorporate water management guidelines into future construction and renovation initiatives.

Lead in drinking water has been shown to have a substantially detrimental impact on human health and is an additional priority. The U.S. EPA requires that schools take adequate measures to ensure that lead-lined water coolers are repaired, removed, or replaced. Moreover, schools must now test and remove lead contamination from all drinking water sources.

If a school district receives its water from a community system, it may not have water-testing requirements (because they are the responsibility of the local water authority). If, however, a school district has its own wells, it is likely that it will have to comply with numerous water testing requirements. Water treatment systems often involve nitrates, chlorination, and turbidity tests, but the details and expectations will vary from one state or locality to the next.

Having enough water to serve students or support a building expansion is a very real struggle many schools must face. Once an appropriate water source is found, storage levels must be properly maintained, monitored, and treated. Because schools normally operate with peak use time frames, water treatment equipment often has to be sized to handle peak demand. These considerations affect the size of the boiler room during new construction planning, not to mention the construction of building space for storing service equipment and chemicals. Managing water systems requires a well-trained staff or, at the very least, a competent professional firm hired to perform the monitoring and testing. In many states, certificates and permits dictate who can perform these services and how they must be accomplished.

Waste Management

"Waste management" is a catch-all phrase that encroaches on numerous other topics addressed in this chapter. However, because of its overarching significance, waste management warrants a focused discussion of its own.

Trash removal is probably the most high profile aspect of "waste management" in a school setting. In many jurisdictions, it is illegal to dump, burn, or otherwise dispose of solid waste (e.g., paper, wood, aluminum, trash) without a permit. Thus, it is imperative that school districts be aware of applicable local and state laws and regulations concerning solid waste disposal.

Recycling may also play an important role in an organization's waste management plan. In fact, many local township or city ordinances mandate recycling as a component of waste management. In other areas, districts may have to choose between the environmental and social benefits of recycling and the incremental costs incurred by sometimes unprofitable recycling ventures. In any case, both solid waste and recyclables

The Three R's of 21st Century Education

Caring for the environment is consistent with the aims of 21st Century education…

Reading	***= R =***	***Reduce***
Writing	***= R =***	***Reuse***
Arithmetic	***= R =***	***Recycle***

should be transported out of occupied areas as soon as possible after being collected for removal. Storage facilities (even temporary storage areas) must be located away from occupied areas in order to minimize risk associated with both fire and infestation that is inherent to waste management. Accordingly, the prevention of fire and infestation is especially important in these areas.

In the case of hazardous waste, the Right-to-Know Act (http://es.epa.gov/techinfo/facts/pro-act6.html) requires that planning and assessment be undertaken for a range of especially dangerous waste materials—from small engine machine shop oil to science laboratory chemicals. Chemicals used by maintenance and custodial personnel often require notation on a material safety data sheet (MSDS) to verify that proper procedures for use, storage, and disposal have been followed. No potentially hazardous material should be brought into or distributed for use in a facility without having proper labeling and an MSDS on file. It is imperative that staff recognize the potential volatility of chemical agents that can enter breathable air when handled improperly. For example, many people know that when the roof leaks, wood can get wet, and mold can grow. Fewer people, however, know that the bleach that might be used to clean mold stains can itself have serious health ramifications if the space is not properly ventilated during use. Thus, the ongoing review of systems, monitoring, and testing is critical to the recognition and handling of potential hazardous materials.

Certain hazardous waste materials, including asbestos, also require that the organization sign a waste manifest for the receiving dump or waste site. For example, soil contaminated by leaking fuel oil during a tank removal project necessitates that the district sign a waste manifest prior to a dump accepting the material. This manifest may assign ownership and potential liability to the district in the event of a future site clean up mandate. In some cases, storage facilities might offer (for an additional cost) to burn the material, thereby avoiding the waste manifest procedure and negating potential future liabilities. These decisions must be made with forethought, due diligence, and disclosure. They often warrant the advice of the district's legal counsel.

Most states and many localities have laws that restrict the disposal of certain types of waste in public disposal facilities. For example, Massachusetts restricts the placement of cathode ray tubes (CRTs), computer screens, televisions, fluorescent bulbs, and lithium batteries in the trash because of the presence of mercury in their components. Planners must, therefore, consult with authorities about specific waste guidelines applicable to their state and locality.

Medical waste, including blood borne pathogens (BBPs), requires additional supervision and planning. "Universal precautions" is an effective approach to infection

control that states that all human blood and certain bodily fluids should be handled as though they are infectious. Thus, all persons who clean, or otherwise come in contact with, bodily fluids should routinely take appropriate barrier precautions to prevent skin and membrane exposure. This includes wearing gloves, masks, protective eyewear, gowns, and mouth pieces (e.g., during resuscitation). Moreover, needles and sharp instruments also require special care—i.e., used needles should never be recapped or broken by hand. All sites exposed to bodily fluids should be decontaminated by cleaning with a bleach/water solution at a 1:10 ratio or another EPA approved tuberculocidal cleaning agent. All cleaning tools should be disposed of immediately after use (and doubled sealed in 6-mil polyethylene plastic bags as necessary). Referring to local hospitals, clinics, and doctor offices for guidance in this area can be advisable. Procedures for handling medical waste from the nurse's office and athletic training facilities should be clearly written and all staff involved in clean up and transport must be adequately trained. Storage and transportation of such material is also regulated and usually requires the services of certified or licensed individuals or firms.

"Universal Precautions" is an effective approach to infection control that states that all human blood and certain bodily fluids should he handled as though they were infectious. Thus, all persons who clean, or otherwise come in contact with, bodily fluids should routinely take appropriate barrier precautions to prevent skin and membrane exposure.

Another issue complicating blood borne pathogen (and general) cleaning practices is the use of latex gloves by individuals who may have severe latex allergies. The use of latex gloves to handle hazardous materials, and for cleaning in general, is advisable, but employees should be monitored for skin or respiratory reactions. In some cases, the use of latex gloves by students may also be warranted (e.g., in chemistry labs), but such procedures also require monitoring and parental notification.

Waste water management (sewer plants) is another area that schools may need to concern themselves with. From the local community waste plant, to an in-house waste treatment plant, to an onsite drainage field, school staff should have a thorough understanding of their waste water management system. Regardless of ownership, water treatment facilities must be managed and run by certified operators. District owned facilities face special operational concerns that stem from the wide range in demand placed on the system due to the intrinsic variability of the school schedule. On a daily basis, facilities must handle peak flow during school hours (and even more specifically during windows between class periods). Weekends and holidays then present intervals of very low demand. Moreover, prolonged dormancy associated with

summer vacation poses additional start-up issues on an annual basis. Therefore, staff must be prepared for both peak and low flows, and schedule equipment use, maintenance, and testing accordingly. Care of onsite systems should include annual inspections, pumping, and maintenance as needed. Kitchens should have grease traps to prevent grease transport to drainage beds. The beds themselves should be well marked. Science lab and maintenance shop waste water (both potentially carrying hazardous materials) must be managed from their sources all the way to the treatment facility. These pipes must also be protected from accidental damage (e.g., on more than one occasion a local school organization has placed playground equipment right on top of a sewer bed or driven equipment poles through a drainage pipe).

Training Staff to Recognize Environmental Hazards

While it is unlikely that every member of the maintenance staff can become an expert at remedying all of the environmental hazards that can arise in school facilities, it is fair to hope that all maintenance staff can become *trained to identify the signs* of common environmental problems that occur in their work place. Teaching staff to recognize suspicious materials, vulnerable conditions, and potential dangers enables them to take the first step (alerting others) toward protecting themselves, other building occupants, and the integrity of the facility in general. It also assures that most potential problems get remedied before they become full-fledged catastrophes.

Other Major Safety Concerns

The list below denotes several prominent environmental safety issues that can occur in schools:

- Chlorofluorocarbons (CFCs)
- Emergency Power Systems
- Hazardous Materials
- Integrated Pest Management
- Lead Paint
- Mercury
- Personal Protective Equipment
- Polychlorinated Biphenyls (PCB'S)
- Radon
- Storm Water Runoff
- Underground Storage Tanks

Many states have programs to provide schools with onsite assistance in complying with occupational health and safety regulations. Check with your State Department of Labor (or Public Health) or contact http://www.osha.gov/html/consultation.html for more information. Most of these onsite consultation programs are performed without costs or fees although recipients may be obligated to remedy serious health and safety problems identified during the visit. Moreover, the company that provides your organization's worker compensation insurance may also be willing to help assess your workplace for dangerous or unhealthy conditions.

In the following paragraphs, topics are presented that must, at all times, be at the forefront of responsible decision-making regarding environmental safety. Due to the varying nature of environmental circumstances facing the approximately 17,000 school districts across the nation, this list is far from exhaustive. However, Web pointers are provided for gathering more information about a particular issue or concern. Additional information about important environmental issues can be found at the U.S. Environmental Protection Agency's main index page at http://www.epa.gov/ebtpages/alphabet.html.

If there are maintenance problems that potentially affect occupant health or safety (e.g., indoor air quality concerns or fire escape issues), the best policy is to address them immediately, and disclose them as appropriate. Knowing that someone is in danger without warning them is at best unethical, and perhaps even legally negligent. Parents, students, and staff have a legal "right-to-know" if they are being exposed to hazardous materials or unsafe conditions.

Chlorofluorocarbons (CFCs) – The release of ozone-depleting compounds such as chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) that are derived from air conditioning and refrigeration equipment should be minimized. Thus, districts must ensure that all personnel servicing refrigerants are fully certified to do so and are using proper tools and equipment. Moreover, systems must be designed to include redundant valve settings as necessary to minimize the release of CFCs and HCFCs during routine maintenance.

Note that products that generate CFCs are no longer permitted to be produced or sold in the United States. HCFC production will be phased out in the United States in 2003.

Emergency Power Systems – It is imperative that the supply of power to school buildings be protected. If not, there can be both short- and long-term consequences from interruption to service: at best, computers and other valuable equipment will be damaged; at worst, school will be canceled until the power is returned. One strategy for dealing with the possibility of power interruption is the installation of backup Energy & Power Systems. This often means large, multi-purpose, on-site, power generators for general use or smaller, portable, uninterruptible, power supplies (UPSs) for especially valuable equipment.

Hazardous Materials – The use and storage of hazardous materials is an important issue in school facility management. Long-term exposure to chemicals (e.g., as cleaning agents or reactants in chemistry labs) can cause serious health problems. Chemicals can also be fire hazards. Thus, the management of

For more information about the Right-To-Know Act, visit http://es.epa.gov/techinfo/facts/pro-act6.html.

chemicals warrants considerable attention. All such material must be identified and catalogued for proper management (e.g., assigning disposal and storage responsibilities). The Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), also referred to as SARA Title III, does not place limits on which chemicals can be stored, used, released, disposed, or transferred at a facility, but does require a facility to document, notify, and report relevant information to occupants. Right-To-Know requirements affecting a school district include:

- Emergency Planning
- Community Right-to-Know Reporting Requirements
- Emergency Release Notification
- Toxic Chemical Release Inventory Reporting

Whether materials are used to meet custodial or instructional needs, decision-makers should investigate whether alternative, less toxic, supplies could be used for the same purpose. For example, "green experiments" and "microexperiments" (see http://www.epa.gov/greenchemistry/ and http://www.seattle.battelle.org/services/e&s/P2LabMan/) can be substituted for traditional science labs. In any case, hazardous materials must be handled with care (e.g., with gloves and goggles as appropriate), ordered in quantities that minimize the accumulation of unnecessary stock, and stored in flame resistant, lockable, safety cabinets. In addition to storing hazardous materials in a safe manner, they must also be disposed of in a way that is consistent with common sense and applicable local, state, and federal regulations. This decision is sometimes complicated by the degradation of certain hazardous materials, which can become an especially serious problem. How serious? Well, in one school in New England, the local bomb squad had to be called in to remove old, degraded, ether from a chemistry lab. Good record keeping of hazardous material use and supplies can minimize these types of occurrences.

Policy-makers should expressly prohibit the use of some materials in schools. For example, explosives and known or suspected carcinogens should never be permitted in a school environment.

The term "hazardous" is sometimes used in a relative sense—i.e., something that poses a hazard to one person may not necessarily be hazardous to others. Latex gloves are an excellent example of a product that is innocuous to the vast majority of people but can be deadly to a person who has a severe latex allergy. In order to deal with potentially unforeseen disasters such as this, many states have developed registry programs to identify students with severe allergies. School districts should inquire whether their state has done so and encourage students, parents, and staff to register with these valuable health and safety resources as appropriate.

For more information about hazardous materials management, visit the National Clearinghouse for Educational Facilities' Hazardous Materials resource list at ***http://www.edfacilities.org/rl/hazardous_materials.cfm****, which provides a list of links, books, and journal articles about the identification, treatment, storage and removal of hazardous materials found in school buildings and grounds.*

Integrated Pest Management (IPM) - From time to time, virtually every school will experience problems with pest infestation. Integrated Pest Management (IPM) is a program that eliminates or drastically reduces both pests and the use of toxic pesticides in schools. IPM is based on a foundation of prevention, monitoring, and non-toxic pest control methods, which include sanitation improvements, structural repairs, and mechanical, biological, behavioral, or other non-chemical initiatives. IPM focuses not on pesticide use but, rather, on identifying the conditions that foster pest problems and devising ways to change those conditions in order to prevent or discourage pest activity. These methods include modifying the environment to inhibit pest breeding, feeding, or habitat and using pest-resistant or pest-free varieties of seeds, plants, and trees. Moreover, IPM strategies also include changing the behavior of a building's occupants to help prevent problems. This can occur through occupant education that leads to decreases in food waste and litter, improved cleaning practices, pest-proof waste disposal, and preventive structural maintenance.

The goal of an IPM program is to control pest activity while minimizing the use of pesticides and the subsequent risks to human and environmental health.

Six IPM Program Essentials

Adapted from Beyond Pesticides/National Coalition Against the Misuse of Pesticides
701 E Street, S.E. · Washington DC 20003 · 202-543-5450 · www.beyondpesticides.org

Monitoring	*This includes regular site inspections and pest trapping to determine the types and infestation levels of pests at each site.*
Record-Keeping	*A record-keeping system is essential for determining trends and patterns in pest activity. Information recorded during every inspection or treatment should include pest identification, population estimates/distribution, and plans for future prevention.*
Action Levels	*Pests are rarely eradicated. An "action level" is the population size that triggers remediation efforts. Action levels are based on health, economic, or aesthetic risk.*
Prevention	*Preventive measures must be introduced into all existing structures and all designs for future structures. Prevention is and should be the primary means of pest control in an effective pest management program.*
Tactics Criteria	*Chemicals should be used only as a last resort, but when needed, the least-toxic agents should be applied in a manner that minimizes exposure to humans and all non-target organisms.*
Evaluation	*A regular evaluation program is necessary for determining the success of current pest management strategies and plans for future IPM strategies.*

The identification and use of "Least Toxic Pesticides" becomes necessary when non-toxic methods of pest control have not completely addressed pest concerns. "Least toxic pesticides" include:

Pesticides are often temporary fixes that are ineffective over the long term. Sound IPM ensures that pest buildups are detected and suppressed before major outbreaks occur.

- ✓ boric acid and disodium octobrate tetrahydrate;
- ✓ silica gels;
- ✓ diatomaceous earth;
- ✓ nonvolatile insect and rodent baits in tamper resistant containers (or for crack and crevice treatment only);
- ✓ microbe-based pesticides;
- ✓ pesticides made with essential oils (not including synthetic pyrethroids) without toxic synergists; and
- ✓ materials for which the inert ingredients are non-toxic and disclosed.

The term 'least toxic pesticides' does <u>not</u> include an agent that is:

- × determined by the U.S. EPA to be a possible, probable, or known carcinogen, mutagen, teratogen, reproductive toxin, developmental neurotoxin, endocrine disrupter, or immune system toxin;
- × a pesticide in EPA's toxicity category I or II; or
- × an application of any pesticide using a broadcast spray, dusting, tenting, fogging, or baseboard spraying.

If a chemical agent is used (even a 'least toxic pesticide'), a common rule of application is, in its most simple terms, to follow the labeled instructions without deviation. In fact, in some states, the axiom "the label is the law" applies.

A school district is responsible for ensuring that its contractors take all appropriate measures to ensure compliance with safety regulations.

Good practices for pesticide use include:

- ✓ Demanding that all persons who apply pesticides and other pest control agents be licensed by the state or locality.
- ✓ Expecting that all persons who apply pesticides and other pest control agents renew their certification every three years in order to keep abreast of evolving technologies and standards.
- ✓ Notifying students and parents prior to the application of pesticides in and around schools.
- ✓ Notifying school staff of prior to the application of pesticides because of the extended amount of time staff spend in the school environment.

- ✓ Maintaining records of pesticide application for a minimum of three years (or more for longer lasting agents such as termiticides). This includes the application date, application site (as specific as possible), pesticide brand name, pesticide formulation, EPA registration number, total application amount (strength, rate, and duration), and the name and identification number of the certified individual applying the pesticide.

Moreover, schools that choose to apply pesticides with their own personnel should obtain a business license, which will include documentation that specifies applicable local and state requirements for the certification of personnel and insurance protection.

> ***IPM is based on learning about pest needs – i.e., food, water, and habitat—and reducing their sources. This often necessitates improved cleaning of food and food areas, placing food in sealed containers, disposing of food and food wrappers in sealed garbage containers, repairing leaky pipes and faucets, caulking cracks and crevices, and eliminating other clutter that can serve as pest habitats.***

For more information about pesticides and integrated pest management, visit www.beyondpesticides.org for summaries of the 33 state laws governing integrated pest management, pesticide restrictions, and right-to-know. Also, visit the National Clearinghouse for Educational Facilities' IPM resource list at http://www.edfacilities.org/rl/pests.cfm, which provides a list of links, books, and journal articles about the use of pesticides, integrated pest management guidelines, specifications, training, implementation and management in school buildings and grounds.

Lead Paint – Lead has been shown to have a detrimental impact on human health. Lead-based paint causes numerous health risks during its application, deterioration, and subsequent release into the air and water. When assessing a building for lead exposure, considerations include building age, facility use, and occupant age and activity. Results from dust, soil, and air sampling are also necessary for designing control strategies. Abatement options include the removal and replacement of affected parts (e.g., windows and doors covered with lead-based paints), stripping of paint (which, because of the associated health risks, must be performed by specialists in hazardous waste removal), encapsulation, and enclosure. Moreover, actions must be taken to ensure the appropriate handling and disposal of hazardous materials generated by lead-based paint removal.

> ***It is imperative that lead paint be identified prior to disturbance—i.e., if lead paint is disturbed, it must be remedied at considerable expense; however, if it is identified, it can be safely encapsulated by simply painting over it.***

Mercury – Mercury is a silvery colored heavy metal that is liquid at room temperature. A person can be exposed to mercury by breathing contaminated air, swallowing or eating contaminated water or food, or having skin contact with mercury. When liquid mercury is exposed to the

atmosphere it emits vapors that are dangerous to human health. At high doses, mercury exposure can cause a range of nervous system problems, including tremors, the inability to walk, convulsions, and even death. At levels more commonly seen in the United States, the effects of mercury exposure are usually more subtle, although still potentially serious, and include damage to the senses and brain. Thus it is imperative that school organizations consider their use of mercury and mercury-containing products and develop policies to ensure that students, staff, and other building occupants are protected from mercury exposure and mercury-related health risks. At a minimum, all mercury-containing equipment (e.g., fluorescent lights, mercury vapor lamps, metal halide lamps, high pressure sodium lamps, neon lamps, light switches, relays, thermostat probes, thermometers, and laboratory solutions) should be handled according to universal hazardous waste protocols, including during disposal. Moreover, as mercury-containing equipment reaches the end of its useful life, it should be replaced with mercury-free alternatives. Most environmental experts now recommend that schools adopt mercury-free purchasing policies, conduct mercury audits, and train teachers and staff to respond appropriately in the event of a mercury spill. Deficiencies in an employer's mercury management and training program that contribute to potential exposure can be cited by environmental and workplace authorities.

For more information about mercury, visit the EPA's mercury site at http://www.epa.gov/mercury/index.html.

Personal Protective Equipment – The Personal Protective Equipment (PPE) program, as initiated by the Occupational Safety and Health Administration (OSHA), the Centers for Disease Control and Prevention (CDC), and many states, is intended to protect employees from the risk of injury and illness by creating a barrier against workplace hazards. In general terms, PPE requires employers to conduct an assessment of their workplace to determine whether there are environmental or safety hazards to which employees are exposed that necessitate the use of protective equipment. Employers should provide a written program to evaluate hazards, indicate appropriate control measures, provide (and pay for) protective equipment, train staff to use protective equipment properly, certify that such training has occurred, and hold yearly inspections and reviews to determine whether the efforts are preventing employee injury and illness. Deficiencies in personal protective equipment programs that lead to exposures and/or physical harm or death can result in citations and monetary penalties.

For a more detailed description of PPE requirements, visit the OSHA PPE site at http://www.osha.gov/SLTC/personalprotectiveequipment/ or the CDC PPE site at http://www.cdc.gov/od/ohs/manual/pprotect.htm.

Polychlorinated Biphenyls (PCBs) – PCBs discharged into the environment pose a risk to humans and wildlife. In schools, PCB sources include leaking fluorescent lights and electrical transformers. Thus, the use of PCB transformers near food or feed sources, or commercial buildings (including schools), should be prohibited. Surveys must be performed in order to identify and remedy all potential sources of PCBs.

Radon – Radon is a naturally occurring gas that poses a danger to people if it accumulates in unventilated areas and is inhaled for long periods of time (potentially causing lung cancer). Airborne levels greater than 4 pCi/L are considered "high" and must be remedied because of their potential danger to human health. As a part of responsible Indoor Air Quality management, radon levels should be tested in school facilities on a regular basis. Moreover, base levels for radon must be established for all buildings. Testers must be certified.

For more information about radon, visit the EPA's Radon resource list at http://www.epa.gov/iaq/radon.

Storm Water Runoff – Storm Water runoff is defined as water from rain or snow that runs off of streets, parking lots, construction sites, and residential or commercial property. It can carry sediment, oil, grease, toxics, pesticides, pathogens and other pollutants into nearby streams and waterways. Once this polluted runoff enters the sewer system, it is discharges into local streams and waterways, which is a major threat to drinking and recreational waters. In order to minimize contamination, storm water runoff standards have been established by the U.S. EPA, state, and local authorities.

For more information about storm water runoff, visit the EPA's Storm Water Runoff regulations site at http://www.epa.gov/fedsite/cd/stormwater.html.

Underground Storage Tanks (USTs) – USTs have been particularly high profile environmental issues during the past few decades. Leaking USTs can contaminate groundwater and lead to the accumulation of potentially explosive gases. In either case, if tanks contain hazardous materials, both people and their environment can be threatened. Each state defines USTs somewhat differently (e.g., some states consider commercial heating oil tanks to be a UST); however, recommended practices for the use and disposal of any UST include:

- ✓ Survey for groundwater channels and reservoirs *before* selecting a site for UST installation.
- ✓ Consider UST abandonment strategies prior to finalizing installation decisions.
- ✓ Adjust levels of scrutiny according to the type of liquid or gas to be stored (e.g., hazardous materials demand more caution than harmless materials).

- ✓ Institute a precautionary testing program for all USTs (including tightness-testing, visual inspection by a certified inspector, and soil and groundwater surveying in the vicinity).
- ✓ Maintain original UST construction and installation records (and backup copies).
- ✓ Maintain detailed inventory records (e.g., percent filled, filling dates, and amounts).
- ✓ Maintain detailed records of testing and inspection results.
- ✓ Ask product suppliers to notify the maintenance manager when new delivery people will be filling the UST so that the work can be reviewed for quality.
- ✓ Keep a spill response kit on the premises at all times. Upon abandonment or discontinued use, remove or seal the UST to meet applicable regulatory standards.

"The Dirty Dozen" of Playground Safety

Published by the National Playground Safety Institute, a Program of the National Recreation & Park Association (http://www.uni.edu/playground/about.html)

1. Improper protective surfacing *- The surface or ground under and around playground equipment should be soft enough to cushion a fall. Improper surfacing material under playground equipment is the leading cause of playground-related injuries. Hard surfaces such as concrete, blacktop, packed earth or grass are not acceptable in fall zones. In fact, a fall onto one of these hard surfaces could be life-threatening. Acceptable surfaces include hardwood fiber, mulch, sand and pea gravel. These surfaces must be maintained at a depth of 12 inches, kept free of standing water and debris, and prevented from becoming compacted (e.g., through routine maintenance efforts). Synthetic or rubber tiles and mats also are appropriate for use under play equipment.*

2. Inadequate fall zone *- A "fall zone" or "use zone" is the area around and beneath the playground equipment where a child might fall. A fall zone should be covered with protective surfacing material and extend a minimum of 6 feet in all directions from the edge of stationary play equipment such as climbers and chin-up bars. The fall zone at the bottom or exit area of a slide should extend a minimum of 6 feet from the end of the slide for slides 4 feet or less in height. For slides higher than 4 feet, take the entrance height of the slide and add 4 feet to determine how far the surfacing should extend from the end of the slide. Swings require a much greater area for the fall zone. The fall zone should extend two times the height of the pivot or swing hanger in front of and behind the swings' seats. The fall zone should also extend 6 feet to the side of the support structure.*

3. Protrusion and entanglement hazards *- A protrusion hazard is a piece of hardware that might be capable of impaling or cutting a child if a child should fall against it. Some protrusions also are capable of catching strings or items of clothing, causing entanglement that could result in strangulation. Examples of protrusion and entanglement hazards include bolt ends that extend more than two threads beyond the face of the nut, hardware configurations that form a hook or leave a gap or space between components, and open "S" type hooks. Rungs or hand holds that protrude outward from a support structure may be capable of causing eye injury. Special attention should be paid to the area at the top of slides and sliding devices. Ropes should be anchored securely at both ends and not be capable of forming a loop or a noose.*

4. Entrapment in openings *- Enclosed openings on playground equipment must be checked for head entrapment hazards. Children often enter openings feet first and attempt to slide through the opening. If the opening is not large enough it may allow the body to pass through the opening and trap the head. Thus, no openings on playground equipment should measure between 3 1/2 inches and 9 inches in diameter.*

5. Insufficient equipment spacing *- Improper spacing between pieces of play equipment can cause overcrowding of a play area, which may create hazards. Fall zones for equipment that is higher than 24 inches above the ground cannot overlap. Therefore, there should be a minimum of 12 feet in between two play structures to provide room for children to circulate and prevent the possibility of a child falling off one structure and striking another structure. Swings and other pieces of moving equipment should be located in an area away from other structures.*

"The Dirty Dozen" of Playground Safety (continued)

6. Trip hazards *- Trip hazards are created by play structure components (or other items) on the playground. Exposed concrete footings, abrupt changes in surface elevations, containment borders, tree roots, tree stumps and rocks are all common trip hazards that are often found in or near play equipment.*

7. Lack of supervision *- The supervision of a playground environment directly relates to the overall safety of the environment. A play area should be designed so that it is easy for a caregiver to observe children at play.*

8. Age-inappropriate activities *- Children's developmental needs vary greatly from age 2 to age 12. In an effort to provide a challenging and safe play environment for all ages, it is important to make sure that the equipment in the playground setting is appropriate for the age of the intended user. Areas for preschool age children should be separate from areas intended for school age children.*

9. Lack of maintenance *- In order for playgrounds to remain in "safe" condition, a program of systematic, preventive maintenance must be undertaken. There should not be missing, broken, or worn-out components, and all hardware should be secure. The wood, metal, or plastic should not show signs of fatigue or deterioration. All parts should be stable without apparent signs of loosening. The surfacing material also must be maintained, and signs of vandalism should be noted and subsequently monitored.*

10. Pinch, crush, shearing and sharp, edge hazards *- Components in the play equipment should be inspected to make sure that there are no sharp edges or points that could cut skin. Moving components such as suspension bridges, track rides, merry-go-rounds, seesaws, and some swings should be checked to make sure that there are no moving parts or mechanisms that might crush or pinch a child's finger.*

11. Platforms without guardrails *- Elevated surfaces such as platforms, ramps, and bridge ways should have guardrails that will prevent accidental falls. Preschool age children are more at risk from falls; thus, equipment intended for this age group should have guardrails on any elevated surface higher than 20 inches. Equipment intended for school-age children should have guardrails on elevated surfaces higher than 30 inches.*

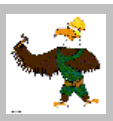
12. Equipment not recommended for the public *- Accidents associated with the following equipment have resulted in the Consumer Product Safety Commission recommending that they not be used in playgrounds:*

- ✖ *heavy swings such as animal figure swings and multiple-occupancy/glider type swings;*
- ✖ *free swinging ropes that may fray or form a loop;*
- ✖ *swinging exercise rings and trapeze bars that are considered to be athletic equipment and, therefore, are not recommended for public playgrounds. Overhead hanging rings that have a short amount of chain (generally four to eight rings) are acceptable on public playground equipment.*

To receive a copy of "The Dirty Dozen" brochure, send a request, along with a self-addressed, stamped envelope, to the National Playground Safety Institute, 22377 Belmont Ridge Road, Ashburn VA 20148.

** In addition to the issues above, pressure treated wood is another important concern for outdoor facilities. While this material lasts longer than untreated wood, it can release unwanted chemical contaminants (e.g., arsenic) that make the area dangerous for children and adults. Thus, it is best that the use of treated wood be phased out in the school setting. Note, however, that both the wood and the soil/sand on which it rested should be removed from the playground because of the likelihood of soil contamination.*

For more information about playground safety, visit the National Clearinghouse for Educational Facilities' Playground Safety resource list at http://www.edfacilities.org/rl/playgrounds.cfm, which provides a list of links, books, and journal articles about playground design for varying age levels, including resources on safety, accessibility, equipment, surfaces, and maintenance.



Good Facilities Management Alleviates Both Health and Financial Concerns

The County's student population had risen dramatically in the last few years, so when the School Board proposed a renovation project to double the size of the middle school, the community responded with overwhelming approval. But just four years after the renovation, staff in the lower level of the new addition began complaining about curling book pages, musty smells, and the onset of respiratory ailments. An initial evaluation of the building showed the appearance of a variety of molds—not a good sign!

Over the course of the next two years, tens of thousands of dollars were spent on testing, consulting expertise, cleaning, and carpet replacement. Although many symptoms were identified, it wasn't until investigators reviewed the facility's "as-built" drawings that a cause was discovered. It seems that the building contractor had run into a clerical snafu during HVAC installation and had received a univent system that was larger than ordered. Since the mistake was on the part of the manufacturer, the bigger, and more expensive, system wasn't going to cost the contractor any more money (whereas returning the piece and waiting for the right sized replacement to arrive would cost time). Thus, the contractor installed the larger univent. Unfortunately, the oversized cooling coils in the system moved air so quickly that it was being cooled without being dehumidified—and the excess water vapor that was left in the air was free to condense throughout the building, causing paper to yellow, mold to grow, and occupants to get sick.

Of course, the School Board had relieved the building contractor of liability several years earlier when the renovation had been completed. Thus, several Board members were reluctant to consent to the project to replace and downsize the univents and install power exhaust fans… but the fact that students and staff alike were falling ill meant that they had no choice but to deal with the hundred thousand dollar problem!

Environmental health and safety is regulated by several authorities, including federal regulations, state laws, local laws, district policies, and good, old fashioned, common sense. While these guidelines cite several relevant federal laws, they cannot detail the wide range of individual state, local, and district-level regulations, many of which vary considerably between jurisdictions. For more information about federal and state regulations, visit the U.S. Environmental Protection Agency's Links to EPA Regional Office and State Environmental Departments Web Page at http://www.epa.gov/epapages/statelocal/envrolst.htm.

Environmentally Friendly Schools

There is currently a growing emphasis on creating environmentally friendly school buildings, sometimes referred to as "green schools", "sustainable schools", or "high performance schools". Once upon a time, the term "environmentally friendly" was considered to be synonymous with both higher initial costs and higher operating costs. However, this assumption is no longer valid. School buildings and school budgets can benefit immensely from the green concept when properly applied. This goal is best accomplished by emphasizing long-term sustainable systems, including the concept of building life cycle costs.

The sustainable high performance school concept seeks to introduce a comprehensive environmental approach to all aspects of school design, construction, operations and maintenance. The benefits are numerous, including:

- ✓ Improved occupant health, motivation and productivity
- ✓ Improved flexibility when designing facilities
- ✓ Reduced energy use, water use, maintenance and insurance costs, and operation costs.

Websites designed to help with the development and construction of high performance schools include:

The National Best Practices Manual for Building High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
Energy Design Guidelines for High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
High Performance School Buildings
http://www.edfacilities.org/rl/high_performance.cfm

Moreover, the U.S. Green Building Council (http://www.usgbc.org) provides evaluation tools on this front through the Leadership in Energy and Environmental Design (LEED) initiative. LEED is a self-assessing system designed for rating new and existing buildings. It evaluates environmental performance from a "whole building" perspective over the building's entire life cycle, and provides a definitive standard for what constitutes a “green” building. LEED is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts.

Securing School Facilities

security \si-'kyur-?t-e\ *n* : freedom from danger; freedom from fear or anxiety; measures taken to guard against crime or attack.

Securing a facility refers to ensuring the physical security of *both* a facility and its occupants—and demands a comprehensive approach to planning. At a minimum, planners must consider the following issues of paramount importance:

- ✓ **Locking Systems**
  - ✓ Install locks on doors and windows as appropriate.
  - ✓ Maintain locking devices responsibly so that keys and combinations are protected.
  - ✓ Change locks that get compromised.

- ✓ Assign locking responsibilities to individuals and spot check them to ensure that the job is being handled properly.
- ✓ Forbid manipulation of locks and entries (e.g., propping doors open).

Securing school facilities depends most of all upon common sense. Locks can be installed, but entrances will remain security breaches if people insist on propping them open.

✓ **Equipment Protection**

- ✓ Secure particularly valuable equipment (e.g., computers) with heavy-duty cables and locks.
- ✓ Keep an up-to-date log of all valuable equipment, including equipment location, brand, model, and serial number.
- ✓ Label equipment in a visible way to deter theft (e.g., with fluorescent paint, permanent markers, or engraving equipment).
- ✓ Simultaneously label equipment in an unobtrusive way (e.g., labels hidden inside the computer case so that they are less likely to be noticed and removed) so that it can be identified if stolen and later recovered.
- ✓ Never leave expensive portable equipment unattended (e.g., don't leave a laptop computer on the desk of an unlocked office).

✓ **Visibility**

- ✓ Keep vehicle routes clear in terms of the field of view (e.g., trim hedges and branches around intersections, stoplights, and signs).
- ✓ Keep pedestrian paths clear in terms of the field of view (e.g., trim hedges and branches along sidewalks).
- ✓ Keep pedestrian paths well lighted.
- ✓ Install security lighting and motion detector lighting outside of back windows and doors.

✓ **Police/security facilities**

- ✓ Train all security personnel in a professional manner and expect (and demand) professional behavior at all times.
- ✓ Install metal detectors at building entries as necessary.
- ✓ Install surveillance cameras in otherwise unobservable parts of the buildings as necessary.

✓ **Fire Protection**

- ✓ Maximize structural fire protection by building full height walls and fireproof ceilings.
- ✓ Install fire response equipment as appropriate (e.g., automatic sprinklers and well-marked manual fire extinguishers).

✓ **Communications Systems**

- ✓ Provide administrators (or all staff) with wireless handsets equipped with 911 panic buttons.
- ✓ Develop and practice an Emergency Communications Action Plan for contacting local fire, police, and medical authorities in an emergency.

✓ **Crisis Management/Disaster Planning**

- ✓ Perform a risk-assessment to determine potential threats and risks facing the organization.

- ✓ Convene top-level managers to determine appropriate crisis and disaster response for the organization.
- ✓ Include staff from throughout the organization in planning efforts.
- ✓ Include representatives from outside the organization as necessary for coordinating response with police, fire safety, and emergency services.
- ✓ Write policies in a way that can be understood by staff members who will be expected to implement it.
- ✓ Practices crisis and disaster response activities.
- ✓ Visit http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297 to read the detailed school security planning guidelines presented in *Safeguarding Your Technology*, a free publication developed by the National Forum on Education Statistics.

For more information about school security, visit the following Web pages: Keep Schools Safe at http://www.keepschoolssafe.org; National School Safety Center at http://www.nssc1.org/ *; and Safe and Drug Free Schools Program at http://www.ed.gov/offices/OESE/SDFS.*

Commonly Asked Questions

Does the 'environment' really affect student learning? Yes. Any factor that affects student health is also likely to influence student attendance and alertness as well. For example, if a classroom exhibits poor indoor air quality, the likelihood of students suffering from respiratory illness increases substantially—which results in higher absenteeism rates. Moreover, if teaching staff are also exposed to unhealthy environmental conditions, it is likely that they will miss school more often as well, which results in more substitute teachers and disrupted instructional programs.

How does a school district become better informed about the regulations and laws with which they must comply? There is no doubt that there are numerous federal, state, and local laws that must be considered (and, in some instances, followed to the letter) when managing school facilities. Very few people will argue that doing so is an easy task. However, these laws and regulations are intended to protect both our children and environment, and must, therefore, be complied with. School districts should expect assistance from both federal and state regulatory agencies in terms of ensuring that existing regulations are understood and properly implemented. Districts should also consider contacting peer organizations in order to exchange information and ideas about compliance strategies.

How does an organization know when it has met its obligation of providing safe, healthy, and environmentally friendly facilities? There is no way to confirm 100% effectiveness on these fronts. However, if a district makes the effort to learn about the issues and expectations (i.e., the laws), proactively comply with the regulations, train staff thoroughly, and perform self-evaluations regularly, it should feel confident that it is doing everything it can to ensure occupant health and safety and preserve the environment. On the other hand, trouble is sure to arise if an organization chooses to ignore or otherwise neglect these serious issues as a matter of practice. In other words, hoping for the best is not an acceptable management strategy from the perspective of either the public or the regulatory agencies charged with protecting the public.

Environmental Safety Checklist

More information about accomplishing checklist points can be found in the text on the page listed in the right hand column..

Accomplished		Check Points	Page
Yes ✓	No ✕		
		Do facilities planners recognize that occupant safety is always their overarching priority?	61
		Has the organization contacted regulatory agencies (e.g., the EPA), the U.S. Department of Education, its state department of education, professional associations, and peer institutions to obtain information about applicable environmental regulations?	61
		Does the district have a plan for responsibly managing indoor air quality?	62
		Does the district have a plan for responsibly managing asbestos?	66
		Does the district have a plan for responsibly managing water quality and use?	68
		Does the district have a plan for responsibly managing waste handling and disposal?	69
		Does the district have a plan for responsibly managing CFCs and HCFCs?	73
		Does the district have a plan for responsibly managing emergency power systems?	73
		Does the district have a plan for responsibly managing hazardous materials?	73
		Does the district have a plan for responsibly managing integrated pest management?	75
		Does the district have a plan for responsibly managing lead paint?	77
		Does the district have a plan for responsibly managing mercury?	77
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		Does the district have a plan for responsibly managing PCBs?	79
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		Does the district have a plan for introducing environmentally friendly school concepts to new construction and renovation projects?	82
		Does the district have a plan for responsibly managing locking systems?	83
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Additional Resources

Every effort has been made to verify the accuracy of all URLs listed in this guide at the time of publication. If, however, a URL is no longer working, please use the root directory to search for a page that may have moved since the release of this guide. E.g., if the link to http://www.epa.gov/iaq/schools/performance.html is not working, try http://www.epa.gov/ and search for "IAQ".

Asbestos
http://www.edfacilities.org/rl/asbestos.cfm
A list of links, books, and journal articles about how asbestos abatement and management is conducted in school buildings, and how schools should comply with federal regulations. National Clearinghouse for Educational Facilities, Washington, DC.

Beyond Pesticides
http://www.beyondpesticides.org
A non-profit membership organization formed to serve as a national network committed to pesticide safety and the adoption of alternative pest management strategies.

California Collaborative for High Performance Schools (ChiPS)
http://www.eley.com/chps/designers/index.htm
ChiPS aims to increase the energy efficiency of public schools in California by marketing information, service, and incentive programs directly at school districts and designers. The goal is to facilitate the design of high performance schools: environments that are not only energy efficient, but also healthy, comfortable, well lit and contain the amenities needed for a quality education.

Children's Environmental Health Network
http://www.cehn.org
A national multidisciplinary project dedicated to promoting a healthy environment and protecting children from environmental hazards. The site presents a variety of publications and materials.

Creating Safe Learning Zones: The ABC's of Healthy Schools
http://www.childproofing.org/ABC.pdf
A primer prepared by the Healthy Buildings Committee of the Child Proofing Our Communities campaign to offer guidance about constructing, maintaining, and renovating healthy schools.

Disaster Planning and Response
http://www.edfacilities.org/rl/disaster.cfm
A list of links, books, and journal articles about building or retrofitting schools to withstand natural disasters and terrorism, developing emergency preparedness plans, and using school buildings to shelter community members during emergencies. National Clearinghouse for Educational Facilities, Washington, DC.

Energy Design Guidelines for High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A document written by the U.S. Department of Energy specifically for architects and engineers, the manual is designed to help design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC

Energy $mart Schools: Designing New Buildings
http://www.eren.doe.gov/energysmartschools/build_design.html
A guide for those interested in designing schools to reduce energy consumption and costs while ensuring productive learning environments. Although the guide is geared toward the design of a single school building, communities can apply the principles to all new schools in the planning, design, or construction phases.

Green Schools
http://www.ase.org/greenschools/
A comprehensive program designed for K-12 schools to create energy awareness, enhance experiential learning, and save schools money on energy costs.

Hazardous Materials
http://www.edfacilities.org/rl/hazardous_materials.cfm
A list of links, books, and journal articles about the identification, treatment, storage and removal of hazardous materials found in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Healthier Cleaning & Maintenance: Practices and Products for Schools
This paper provides guidance to schools with regard to selecting , purchasing, and using environmentally-preferable cleaning products. Healthy Schools Network, Inc. (1999) New York State Association for Superintendents of School Buildings and Grounds, Albany, NY, 8p.

Healthy Schools Network, Inc.
http://www.healthyschools.org/
A not for profit education and research organization dedicated to securing policies and actions that will create schools that are environmentally responsible for children, staff, and communities.

Healthy School Handbook: Conquering the Sick Building Syndrome and Other Environmental Hazards In and Around Your School
This book compiles 22 articles concerning sick building syndrome in educational facilities, with attention given specifically to determining whether a school is sick, assessing causes and initiating treatment, and developing interventions. Miller, Norma L., Ed. (1995) National Education Association, Alexandria, VA, 446p.

High Performance School Buildings
http://www.edfacilities.org/rl/high_performance.cfm
A resource list of links and journal articles describing a sustainable approach to school building design, engineering, materials selection, energy-efficiency, lighting, waste management strategies (also called "green design"). National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality (IAQ)
http://www.edfacilities.org/rl/iaq.cfm
A list of links, books, and journal articles about indoor air quality issues in K-12 school buildings, including building materials, maintenance practices, renovation procedures and ventilation systems. National Clearinghouse for Educational Facilities, Washington, DC.

Indoor Air Quality (IAQ) Tools for Schools
http://www.epa.gov/iaq/schools/

This U.S. Environmental Protection Agency Kit shows schools how to carry out a practical plan for improving indoor air problems at little or no cost by using straightforward activities and in-house staff. The Kit includes checklists for all school employees, a flexible step-by-step guide for coordinating the checklists, an IAQ problem-solving wheel, a fact-sheet on indoor air pollution issues, and sample policies and memos.

Integrated Pest Management
http://www.edfacilities.org/rl/pests.cfm
A list of links, books, and journal articles about integrated pest management guidelines, the use of pesticides, staff training, and program implementation and management in school buildings and grounds. National Clearinghouse for Educational Facilities, Washington, DC.

Janitorial Products: Pollution Prevention Project
http://www.westp2net.org/Janitorial/jp4.htm
This site is sponsored by the US Environmental Protection Agency and includes fact sheets, product sample kits, purchasing specifications, and other materials to advise users on the health, safety, and environmental consequences of their janitorial products.

Keep Schools Safe
http://www.keepschoolssafe.org
This site is the result of a partnership between the National Association of Attorneys General and the National School Boards Association to address the subject of school violence. A bibliography on school violence resources is provided, as is information specific to school security, environmental design, crisis management, and law enforcement partnerships.

Lead-Safe Schools
http://socrates.berkeley.edu/~lohp/Projects/Lead-Safe_Schools/lead-safe_schools.html
The Lead-Safe Schools program was established by the Labor Occupational Health Program at the University of California at Berkeley to house publications, provide training to school maintenance staff, and offer a telephone hotline to school districts and staff.

LEED™ Rating System
http://www.usgbc.org/
LEED™ is a self-assessing system designed for rating new and existing commercial, institutional, and high-rise residential buildings. It evaluates environmental performance from a "whole building" perspective over a building's life cycle and provides a definitive standard for what constitutes a green building. LEED is based on accepted energy and environmental principles and strikes a balance between known effective practices and emerging concepts.

Mercury
http://www.epa.gov/mercury/index.html
The Environmental Protection Agency is working to reduce the amount of mercury in the environment. This Website includes both general and technical information about mercury and mercury reduction strategies.

Mercury in Schools and Communities
http://www.newmoa.org/newmoa/htdocs/prevention/mercury/schools/
Information on this Website comes from the Northeast Waste Management Officials' Association (NEWMOA), which was funded by the Massachusetts Department of Environmental Protection and the Massachusetts Executive Office of Environmental Affairs to assist in identifying and removing elemental mercury and products containing mercury from schools and from homes.

National Best Practices Manual for Building High Performance Schools
http://www.eren.doe.gov/energysmartschools/order.html
A document written by the U.S. Department of Energy specifically for architects and engineers,

the manual is designed to help design or retrofit schools in an environmentally friendly manner. U.S. Department of Energy, Washington, DC

National Program for Playground Safety
http://www.uni.edu/playground/about.html
The National Program for Playground Safety describes playground safety issues, safety tips and FAQs, statistics and additional resources, and action plans for improving playground safety.

National School Safety Center
http://www.nssc1.org/
The National School Safety Center is an internationally recognized resource for school safety information, training and violence prevention. The Website contains valuable summaries of school safety research, including contact information for locating the studies.

Playgrounds
http://www.edfacilities.org/rl/playgrounds.cfm
A list of links, books, and journal articles about playground design for varying age levels, including resources on safety, accessibility, equipment, surfaces, and maintenance. National Clearinghouse for Educational Facilities, Washington, DC.

Poisoned Schools: Invisible Threats, Visible Actions. A Report of the Child Proofing Our Communities: Poisoned School Campaign.
http://www.childproofing.org/poisonedschoolsmain.html
This report includes more than two dozen case studies of schools built on or near contaminated sites or where children have otherwise been exposed to pesticide use in and around school buildings. Gibbs, Lois (2001) Center for Health, Environment and Justice, Child Proofing Our Communities Campaign, Falls Church, VA, 80p.

Radon Prevention in the Design and Construction of Schools and Other Large Buildings
http://www.epa.gov/ordntrnt/ORD/NRMRL/Pubs/
This report outlines ways in which to ameliorate the presence of radon in schools buildings. The document initially develops the reader's understanding of underlying principles and later provides more technical details that might best be used by the architects, engineers, and builders responsible for building construction. U.S. Environmental Protection Agency (1994), Washington, DC, 51p.

Safe and Drug Free Schools Program
http://www.ed.gov/offices/OESE/SDFS
The Safe and Drug Free Schools Program was created as a part of the federal government to reduce drug use, crime, and violence in U.S. schools. Its website contains many full-text publications on school safety and violence-prevention.

Safeguarding Your Technology
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=98297
These guidelines have been prepared by the National Forum on Education Statistics to help educational administrators and staff at the building, campus, district, and state levels better understand why and how to effectively secure an organization's sensitive information, critical systems, computer equipment, and network access. The document is available electronically at no cost. Technology Security Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC.

Safety and Security Design
http://www.edfacilities.org/rl/safety_security.cfm
A list of links, books, and journal articles about designing safer schools, conducting safety assessments, implementing security technologies, and preventing crime through environmental design. National Clearinghouse for Educational Facilities, Washington, DC.

Safety in Numbers: Collecting and Using Crime, Violence, and Discipline Incident Data to Make a Difference in Schools
http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2002312
These guidelines have been prepared by the National Forum on Education Statistics for use by school, district, and state staff to improve the effectiveness disciplinary incident data collection and use in schools. It provides recommendations on what types of data to collect and how the data can be used to improve school safety. The document is available electronically at no cost. Crime, Violence and Discipline Task Force, National Forum on Education Statistics (1998) National Center for Education Statistics, Washington, DC

Storm Water Runoff
http://www.epa.gov/fedsite/cd/stormwater.html
A list of Storm Water Management Regulatory Requirements provided by the US EPA.

THOMAS Legislative Information on the Internet
http://thomas.loc.gov
The THOMAS site is maintained by the U.S. Congress to provide status reports on proposed legislation.

Underground Fuel Storage Tanks
http://www.cefpi.org/issue4.html
A briefing paper published by the Council of Educational Facility Planners International (CEFPI) about the responsibilities associated with owning and securing an underground fuel storage tank. McGovern, Matthew (1996) Council of Educational Facility Planners, International, Scottsdale, AZ, 5 p.

U.S. Environmental Protection Agency (EPA)
http://www.epa.gov/
The EPA works closely with other federal agencies, state and local governments, and Indian tribes to develop and enforce regulations under existing environmental laws. EPA Regional Office and Linked State Environmental Departments can be found at http://www.epa.gov/epapages/statelocal/envrolst.htm .

U.S. Green Building Council
http://www.usgbc.org
The U.S. Green Building Council Web site is intended to facilitate interaction among leaders in every sector of business, industry, government, and academia with respect to emerging trends, policies, and products affecting “green building” practices in the U.S.